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The Tabor Molding Machine.

The Tabor molding machine was first illustrated and described by us in 1890. A second machine, which in simplicity and efficiency was a great improvement upon the first, was shown in 1891. The first machine had been in satisfactory use for several years before the description of it appeared, which may give an idea of the time which has been devoted by the inventor to the development of this line of apparatus. He is as irrepressible and active as ever, and as keenly in pursuit of improvements for this machine, and for a couple of years has had also the assistance of Mr. E. H. Mumford, who also is a skilled mechanic, and we now have pleasure in showing the latest, although not perhaps the last outcome of their united efforts.

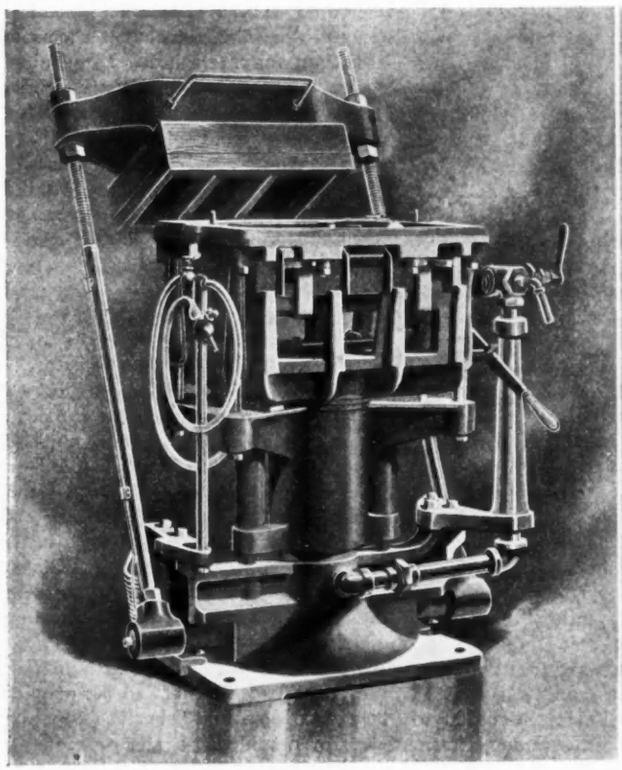

Fig. 1.

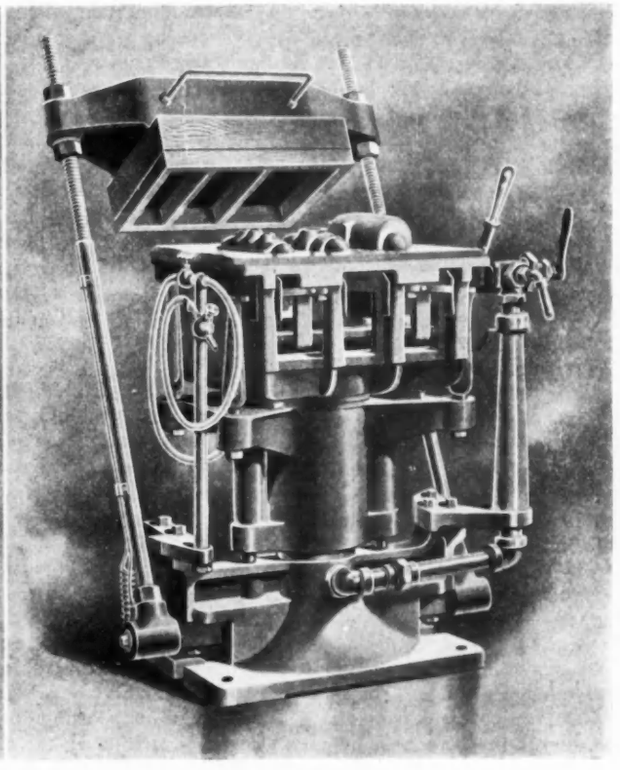

Fig. 2.

THE TABOR MOLDING MACHINE.

The present machine is entirely self-contained, and, what is also of some importance, none of it extends below the floor. Compressed air is used for operating the machine, and the principal element of it is therefore the air cylinder. The cylinder in this case is inverted, while a trunk piston upon which the cylinder rises and falls is in one piece with the base. Vertical rods fixed to the base on each side serve as guides to keep the cylinder from turning. At the upper end of the cylinder four horizontal arms extend out diagonally, and are connected by webs on the casting. These arms carry uprights to which the pattern plate is attached. A skeleton, vertically movable on the cylinder casting, carries a horizontal rectangular flask frame at the top which just fits around the pattern plate, and the top of this frame is flush with the top of the pattern plate when the flask is placed upon it for making the mold. This position is shown in Fig. 2. The patterns mounted on the plate comprise a set of hanger box castings, the top and bottom halves of the box and the drip pan. Pins or holes, as the case may be, in the top of the flask carrier match the corresponding holes or pins in the flask, and locate it precisely.

The pattern is "drawn" by lifting the rammed flask up from the pattern. This lifting is done by a hand lever at the right-hand side of the machine. Fig. 1 shows the lever thrown down and the flask frame lifted up, so that the bottom of the flask will just clear the top of the pattern. When the lever is thus thrown down a little catch holds it until released to drop the frame.

A very important and novel feature of the present machine is the rapping de-

vice. This is situated at the back of the machine, and is operated by a little thumb valve at the left, which admits the air and sets it in motion. The action is similar to that of the various pneumatic hammers now in use. A little solid cylindrical piston is driven back and forth horizontally, with a short stroke and at a high speed, striking the case at each end and effectually shaking the pattern plate independently of the flask and the sand. The blows, as nearly as the speed has yet been ascertained, occur at the rate of about 5,000 per minute, and the result is the absolute freeing of the pattern from the sand. There seems to be no special direction to the rapping effect. The pattern is freed in every direction, while the mold is not enlarged anywhere, as must occur with hand rapping. The rapping, of course, also frees the entire face of the mold, so that there is no hint of adhesion remaining anywhere. The lift being absolutely vertical, it is also not to be compared with a hand lift.

The other features of the machine will perhaps be most easily understood from a simple description of the operation of ramming a flask. Referring to Fig. 2, where the machine is in position for beginning, the operator takes the air hose hung up at the left, and operating the valve with his thumb, passes the air jet quickly over the patterns and blows away any dust or sand that may be found. Then hanging up the hose, he picks up a flask and sets it in place. He sifts in enough sand to cover the patterns, and then shovels in enough to fill the flask, a little experience enabling him to judge the quantity required very closely. He may perhaps even it a little with his hand. Then the ramming head is swung vertically over the flask. This ramming head, carried by the long side rods, is balanced by springs, so that it moves quite easily and stays where placed, either in the vertical or the swung-back position. The under surface of the ramming head is usually flat, but in some cases the shallow boxes are used, as shown. When these are used, a light temporary wooden frame is also placed on the top of the flask. The hight of the ramming head is easily adjusted by the nuts at the side. The lift obtained for the ramming varies from 2 to 6 inches, according to the character and conditions of the work. All being ready, the operator turns on the air by the little three-way valve lever shown at the extreme right, and the cylinder and all that it carries is thrown suddenly and with force up against the ramming head. The operation is not a simple squeeze, but is more of the character of a blow, it being found that the sand actually seems to flow more freely and to pack more uniformly under the quick movement than under a slow one. This operation is usually repeated; a turn of the valve lever in the other direction releases the air, and the cylinder drops. The valve is turned again, the cylinder is again thrown up and again allowed to descend. The ramming head is then swung back. A touch of the thumb on the rapper valve for a second frees the pattern, while the flask is being lifted. If the flat ramming block is used, there will usually be no need of striking off the sand. A little loose sand is scattered over the surface; the bottom board is set on; the lifting lever is thrown down, drawing the pattern, or rather lifting the mold free, and it is then lifted off by hand and set on the floor.

The simplicity and rapidity of the operations involved speak for themselves, and there is no need of our giving figures as to actual performance. What is to be borne in mind, in addition to the speed of the performance, is the absolute uniformity of the work. The hardness of the ramming and the uniformity of the ramming may be adjusted with the utmost nicety, and every mold thereafter will be just the same. It is a good thing for the trade that the machine insists upon good patterns, and good patterns should not necessarily cost more for the machine than for hand work. Where the machine is established and various sets of patterns are in use, a change from one set to another can be made in two minutes. It may be proper to call attention to the fact that the patterns for this machine cost much less and are much more quickly set or changed than with the earlier or stripping plate machine. The system of setting the patterns on the plates, as practiced by the makers of the machine permits either wood or metal patterns to be used and ensures absolute accuracy of match, and as the flasks used must also, as a part of the machine system, match each other and match the machine, there is no possibility of bad joints.

The sprue is of course provided for in making the cope, the gates being a part of the pattern. For patterns having deep vertical draft, and wherever there is a tendency for the same to drop or sag holes are cut in pattern or plate surface and cylindrical pieces called "stools" are loosely fitted to these holes. The "stools" follow the upward motion of the flask and remain in contact with the sand, supporting its lower surface up to the time when the flask is removed from the machine.

The machine is made by the Tabor Manufacturing Company, Elizabeth, N. J.

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United States Consul J. C. Monaghan, of Chemnitz, Germany, reports that the Prussian State railways constitute an important source of revenue to the government; contributing, in fact, about one-half of its total income, and he says that the tendency is towards state ownership of all transportation facilities, and also of telegraph and telephone communication.

The Place of Our Destination—XII.

STOCKHOLM — THE DE LAVAL ENGINE AND ITS HIGH STEAM PRESSURE —SOME STEEL MANUFACTURES.

Editor American Machinist:

Stockholm, a city of some 200,000 inhabitants, built upon six or seven islands, possesses many special characteristics, and prominent above all others is that it is clean, and the way the cleaning is done is this: Every one has to sweep his yard and his sidewalk and the street in front of his place every day. He can do it himself or hire the contractor to do it, but done it must be. They have police, but about all the use they have for them is to see that the streets are kept clean and to direct strangers. A beautiful city is Stockholm, with its massive, well-built buildings, fine streets and parks and statues, with waterways, bridges and the quaint little steamers that carry passengers from one island to another for a mere pittance. The most conspicuous features are the King's palace, a great square building perhaps 300 feet on each side, and the telephone tower.

In no place in the world I fancy does the telephone or the telephone system approach this. The instruments themselves would put some telephones companies to shame. A beautiful little box which may be set on table or bracket has two forks on top in which the instrument is laid when not in use, and the instrument itself contains both the ear trumpet and the mouth piece as well, so that when one takes up the instrument he may stand or sit or get anywhere within the range of the cord, and he has the whole thing with him.

The cost of it for a dwelling by the year is $10, and for a shop or store $17 or $18, and the lines extend all over the country. The tower on top of the central station is an iron structure like the skeleton of a New York "sky scraper," perhaps 40 feet square by five or six stories high above the main building. This tower is literally covered with insulators and the innumerable wires extending off in all directions look when seen from a mile or a mile and a half away, like a cloud.

A part of the town is on a bluff and they have two elevators to lift people up 80 or 100 feet, and from the top of the elevator a bridge 300 feet or more long reaches out to the bluff. The city is where the outlet of a lake 80 miles long empties into the Baltic; this outflow of fresh water keeps the harbor clean.

It is said that the more languages one knows the easier it is to learn another. We find it so. After mastering the English, French and Flemish, German, Dutch and Danish, we get onto the Scandinavian with both feet, so to speak. We have the important words kroner and ore, so we can understand them and make them understand us when we have the proper coin to put in evidence.

We visited the many sights such as

museums, churches, etc., and one, the Riddarholm's church, some hundreds of years old, has an open work spire as sharp as a tack which seems to be made of iron, at least, if constructed of wood it was not built so many hundreds of years ago. The church is no longer a church, but a burial place for kings and contains the bodies of all the kings from that Gustavus Adolphus, the hero of the 30 years war, to the last one who died, Oscar the 1st, and besides these are three thousand battle flags, which shows that the peaceable Swedes have had their wars, and one difference between the old times and now, the kings themselves and those who made the war took a hand in the fights.

We drifted up to this Northern city as much on account of the Northern exhibition as anything, and here the work of Norway, Sweden, Denmark and Russia is shown to far better advantage than could well be done elsewhere. While the exhibition at Brussels is on the one building plan, this is more on the plan first introduced at Philadelphia, and is somewhat on the Chicago plan in miniature. There is not so much, not even as much as at Brussels, but it is fine, and everything is shown off in fine style. The most conspicuous exhibitor is De Laval, who has made a fortune out of his milk separator business, and out of patriotism or policy has gone to great expense to make a show. In Machinery Hall he has built up quite a structure of milk separators outside, milk separators inside and milk separators to show in detail. Outside he has put up a building of considerable magnitude wholly for his impulse rotary engines and dynamos and high pressure boilers. This engine and dynamo combination, that is, one engine driving two dynamos, is the same as shown at Brussels, but instead of a belted condensor pump he has a little rotary one on the outer end of one of the dynamo shafts. This simplifies the construction somewhat, still for the power developed the whole takes up nearly as much space as a high speed horizontal direct connected plant. In spite of all the refinements they make a lot of noise. In principle they are a very simple machine; in fact they are neither so very simple nor cheap as to frighten even me very much, and my courage is very limited. I say this with the full knowledge that one at least, and I believe many, of the best European engineers, predict a future so sweeping for it as to throw many other kinds of engines out of existence.

It has the advantage of simplicity, direct application of the power and economy in steam consumption, but the speed has to be excessive to be economical; has to be reduced from ten to one hundred times to be available for ordinary purposes; makes a lot of noise; must be condensing, and the wheel, which is the costly part, is not expected to last more than about two years. This, at first, would appear a great improvement over the Avery rotary of 50 to 60 years ago, which failed because it had to be repaired every three or four months, but then the cost of the repairs was but a few shillings, while the De Laval will cost a hundred times as much. I understand the expanding nozzle of the steam jet, which it was claimed was one of the reasons of its economy, has been abandoned, but whether in all or in only the high pressure machine I do not know. What I mean by the high pressure are the ones he is running here from his own boilers at what they say is 2,000 pounds pressure.

High pressure steam can be generated for proportionately less fuel than low pressure, and, if the boilers will stand it and not wear out, for proportionately less money. If the impulse and turbine wheels can utilize these high pressures they can do what no reciprocating engine can do, and thus have open to them a source of economy apparently to their advantage; but if the higher steam pressure cuts away the bucket proportionately faster what is gained in steam economy may prove the economy too expensive. They are working out the problem and deserve success. I do not vouch for the 2,000-pound pressure, but the gage showed 120, which they said, and I have no doubt, were kilos to the square centimeter, and the thermometer showed 320 degrees Centigrade, from which you who are conversant with these gages can check up and give the facts in units, we, your readers, can comprehend.*

The boilers, of which there are three or four, with as many generator plants, are enclosed in a vertical shell with brick linings, and consist of very small pipes, probably one-half-inch diameter.

The proper amount of water is fed automatically, and the fire and pressure are controlled automatically by the demand of the engine. I do not know how near red-hot the boiler was, but certainly the steam pipes, which were not over one-half inch, seemed to me would show red in the dark.

The Swedes and the Danes set the pace of the world for dairy products, and it is claimed in Copenhagen that the milk separator was invented there, but that De Laval made better ones and has taken the trade. However that may be, it is more than probable half the success of the invention turned upon the fact that for a long time only Swedish steel would answer the purpose. Swedish iron, because of its purity and weldability, has for years been selected in preference to others for certain purposes, and is still wholly used for the delicate ornamental iron work shown at the Brussels Exposition, and, what is curious about it, when converted into steel it retains the weldable feature to an unusual extent.

* A pressure of 120 kilogrammes per square centimeter corresponds to 1,706 pounds per square inch. A temperature of 322 degrees Centigrade corresponds to 608 degrees Fahr.—Ed.

The Sandvikens Jernverks Aktiebolag, which in plain English is the Sandy Creek Steel Works, have a special building to exhibit their products, and in some respects it is a display unequalled at any exposition at any time or place.

The works at Sandvik have grown up since 1862, and were originally built to make tool steel and weldless locomotive tires, of which there were no makers at the time but Krupp.

This was their principal business for the first ten years, when the English and German makers lowered the price and they changed to the making of lap welded steel boiler tubes. They show axles and tires that have run over 450,000 miles, and locomotive tires that have run over 250,000 miles, with wagon tires that run 140,000 miles without being re-turned.

To show their skill in rolling strips for lap welded tubes a sample is shown 21 inches wide by No. 6 gage, with perfectly square edges. In rolling sheet steel of this thickness no attention is paid to the edges.

After a while the English and German steel makers learned to produce weldable steel and again crowded out the Swedish product, and they took up the manufacture of wire rods and the drawing of wire, and it is at these works that the paragon umbrella ribs are drawn. Drawing flat wire then became a specialty, as for clock springs and corset steel. Wider bands were soon demanded and cold rolling was started, and specimens of thirteen-inch wide are shown, and as extreme samples of what they can do in this line, one piece elegantly polished on both sides, eight inches wide by 2,354 feet long, decorates the sides and under side of the roof of their building. It is 28 gage thick and weighs 1,146 pounds, and if a band 8 inches wide and nearly a half mile long is too big a story to swallow, take the next, which only weighs 43 pounds and is only 2⅜ inches wide, 4,317 feet long by 40 gage, or almost 1¼ thousandths of an inch thick. Band saw blades is a part of their business, and they have made the largest ever turned out in any country, and when the bicycle trade called for steel tubes their lap welded took the lead until the weldless was demanded, and when drilled blooms became too expensive they supplied the world with their new product, which I understand are simply punched in the semi-fluid state.

The building outside and in is a show in steel, and the entrance to the building is through between the uprights of a model of their 15-ton steam hammer.

JOHN E. SWEET.

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Notice has been given that after January 1, 1898, Russia will place agricultural implements and machinery upon the free list. This, it is understood, is done on account of the present depressed state of agriculture in Russia.

Automatic Rim-Drilling Machine.

The business of making wooden rims for bicycle wheels has grown to such magnitude in this country as to justify automatic machines built especially for that purpose and designed to do the work at the fastest possible rate, and we give herewith the views of one of the latest machines brought out for that purpose.

Referring to Fig. 1 it will be seen that the rim to be drilled is held upon a chuck with rotating arms moved in or out to tighten or release the rim by the ordinary scroll movement. This chuck is suspended upon what may be called a pendulum, the center upon which this pendulum swings being coincident with the center of the arc to which the outer surface of the rim is turned. At the time the rim is indexed for each new pair of holes this pendulum is swung, first to the front then to the rear; thus giving to the drilled holes their proper alignment with respect to the spokes.

Above the chuck and attached to the projecting arm at the top are the spindles. There are three of these, the one in the center being intended for drilling the air tube hole, and the others for drilling and countersinking nipple holes, drilling and countersinking being done at the same time in this machine. The two outer spindles can be adjusted to any required distance from the center spindle by loosening the four bolts shown in front of the arm and moving them by means of the balanced crank handles, one of which is seen at either side of the machine. They can also be at the same time adjusted to any angle required by the spacing. The spindles are driven by a single belt, which runs over the large pulley and the idlers seen at the extreme right of Fig. 1, this belt giving ample driving power. The various cam movements required to index the rim, swing the pendulum first one way and then the other, and to feed and return the spindles to their positions are driven by the two shorter belts seen at the rear of Fig. 1. The one passing to the base of the machine drives a worm shaft from which is driven a worm attached to the horizontal shaft projecting at the right of the machine and driving by miter gears shown in Fig. 1, a shaft which passes transversely through the arm of the machine and carries the cams by which the feed and return of spindles is effected. The indexing and swinging of the pendulum are effected by the short belt which passes to the upper portion of the machine and by means of a friction clutch which is released by a stop pin at the proper moment. The indexing mechanism is seen at the left of Fig. 2 and consists of ratchet wheels having various numbers of teeth corresponding to the required indexing. In changing from one number of spokes to another it is only necessary to set the two outer spindles to the proper position and adjust the indexing mechanism and change gears; a change which is effected in about 15 minutes.

When a rim has been put in place the first operation is to drill the air tube hole after which the treadle in front of the machine is depressed, which sets the machine at work automatically. It then first drills and countersinks two spoke holes after which it is indexed for the next position, drills two more holes, and then indexes a greater distance, that is, for four holes, and continues this until the rim is completed, when it automatically stops.

The mechanism will, we think, be readily understood from an inspection of the photographs, and we are informed that the machine has been very carefully de-

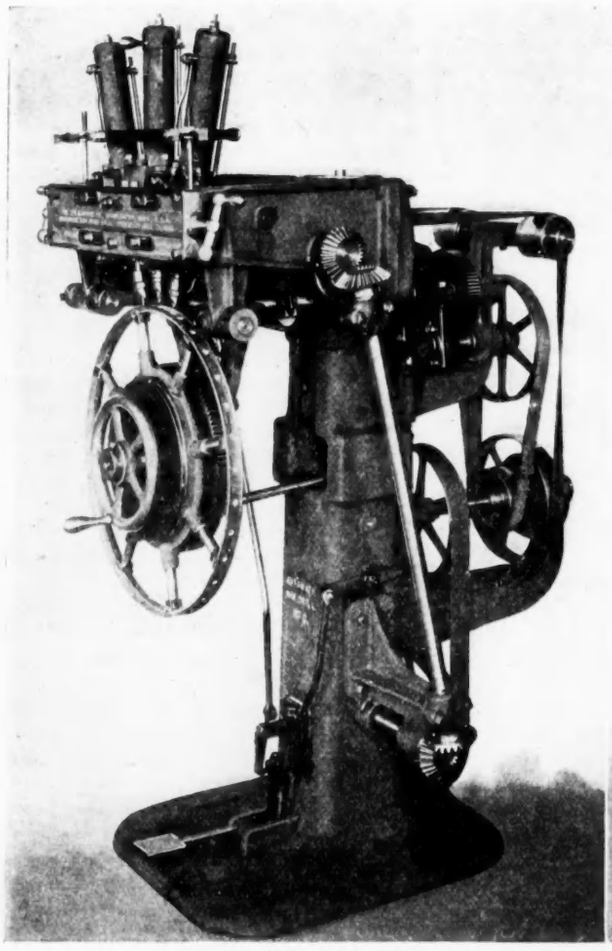

Fig. 1.

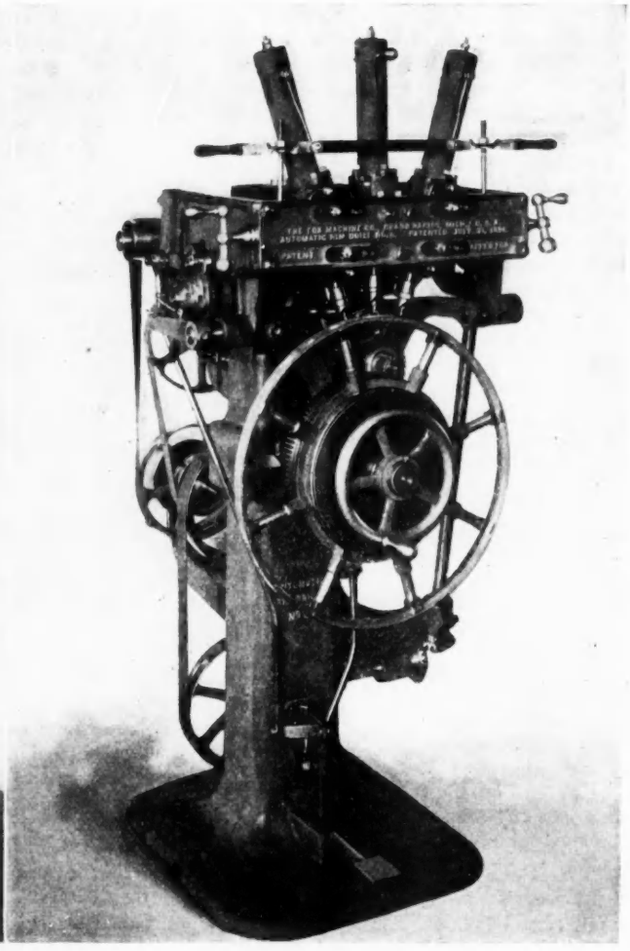

Fig. 2.

AUTOMATIC RIM-DRILLING MACHINE.

signed and built in the light of experience gained with machines previously built for the same purpose. The thrust of the drilling spindles is taken on ball bearings.

It is found that with this machine about 28 seconds of time are required to drill a 28-holed rim and it takes but 6 to 8 seconds to drill a valve hole, and replace the rim on the chuck; it being expected that with this machine and a companion machine designed to automatically insert washers, one man will drill and washer 1,000 rims per day. The machine is made by the Fox Machine Co., Grand Rapids, Mich.

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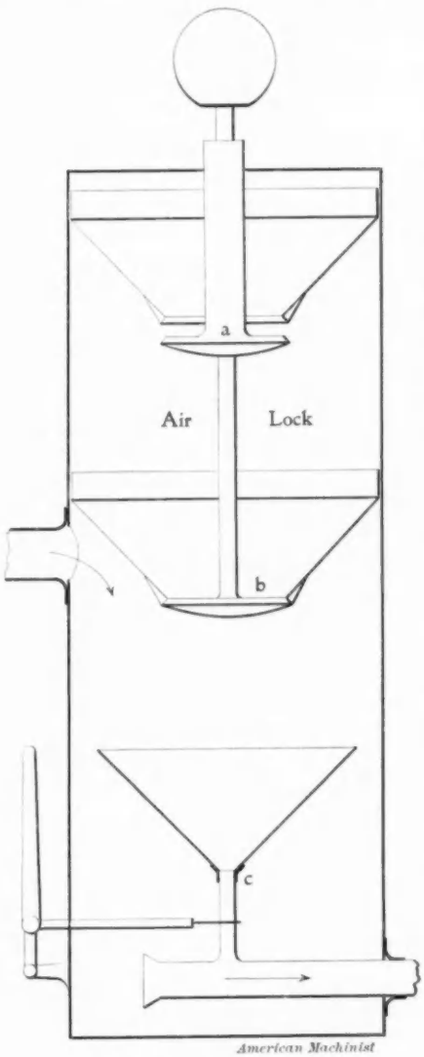
The Sandblast for Structural Steel.

There is now in progress in New York an experiment of the greatest interest and importance, not only to the architects and builders of bridges and steel-framed buildings, but to all who are interested in the protection and preservation of steel and iron work through all its life after leaving the shop or the factory. The One Hundred and Fifty-fifth street viaduct is a fine steel structure, erected five or six years ago, carrying a wide roadway with a walk on each side from the low-lands near the Harlem river up to Washington Heights. At about the middle of the viaduct it crosses the Manhattan Elevated Railway at a hight sufficient to clear the locomotives with some feet to spare. As the terminus of the railway is at this precise point, there is a constant passing and repassing of the engines, and the smoke and gases from them (they burn hard coal) have had a very destructive effect upon the trusses and entire upper work of the viaduct. The deterioration has been so rapid as to be quite alarming, and it has become evidently necessary to employ the best known means, and, indeed, to find, if possible, better than any known means, for the preservation of the metal from rapid corrosion. Paint has been applied over and over again, and its use has developed discouragement rather than anything else. In some cases paint has not lasted more than a single month. It has lately been determined to make a thorough and heroic effort at preservation by inviting all the makers of what are considered the best preservative paints to apply them here side by side, under precisely the same conditions, severe conditions for all, so that the best may be secured and adopted for further use. It was considered very essential before the application of the paint to have the frame-work thoroughly cleaned, and for this service the sand blast has been employed and is now in operation, and in this, and in the results accomplished by it, our readers cannot fail to be interested.

The apparatus employed is really quite simple, and involves nothing that is not easily understood and operated. The air-compressing plant used in this case is of course a temporary one set up on one side of the roadway above. It consists of two Ingersoll-Sergeant steam-actuated horizontal straight-line air compressors and a common vertical tubular boiler. The air cylinder of one compressor is 10 x 12 inches, and of the other 12 x 12 inches, both running at 150 revolutions per minute. The free air delivered per minute is very nearly 400 cubic feet, and there would



MIXING SAND AND AIR.

be about 28 horse-power indicated by the two steam cylinders. The air pressure maintained at the compressor is about 20 pounds. The air is conveyed about 300 feet in a single pipe to a vertical air receiver, which stands near the sand mixers. A separate mixer is used for each jet. Two jets are used constantly, while there is a third and smaller one for occasional use in some specially inaccessible spots.

The sand mixer will be understood sufficiently by reference to the accompanying sketch. The vertical cylindrical shell is, say, 2 feet in diameter and 5 feet total hight. The sand is thrown, a pailful at a time, into the hopper at the top of the mixer. The compressed air, at a pressure a pound or two less than that maintained at the compressors, passes into the lower part of the mixer and out again, laden with the sand, as indicated by the arrows. When the sand is thrown into the hopper, and the valve *a* is open as shown, it flows immediately into the air lock. When a sufficient quantity has flowed down, the operator pulls up valve *a*, and a little blow of the hand on the ball at the top opens valve *b*, when the sand flows into the hopper in the lower chamber. As the compressed air flows along through the lower horizontal pipe, the sand passes down through the passage *c*, and mixes with the air and is carried along by it. The quantity of sand delivered is regulated by the little horizontal sliding gate operated by the lever outside. From the mixer the air and sand are conveyed through a 1½-inch rubber hose to where the work is finally to be done.

The nozzle through which the air and sand mixture is finally delivered is a straight, chilled cast-iron tube, about 1⅛ inches diameter on the outside and 8 inches long, with, at the beginning, a 9-16 inch hole through it. The sand passes through this tube at a velocity of over ten miles per minute, and the tube wears so rapidly that in two hours the hole in it is enlarged to about ⅝ inch, when it must be discarded for a new one, so that it is necessary to keep a large stock of the nozzles on hand.

The sand used is wave-washed beach sand from the shores of Long Island. The grains are quite large, averaging probably 3-32 inch diameter. The sand is passed through and used in the process four times, when it must be discarded for new. The effect upon the sand is, as might be supposed, to fracture the grains by the force of the blow which each strikes upon the metal, and after the fourth turn the sand has become so fine as to be useless. When the sand blast is in operation the sharp particles fly with great force in every direction. It would not be possible for a man to hold the nozzle in operation for one minute without having his face and hands protected. He wears a helmet with a woolen hood which completely covers his head, and gloves protect his hands. In some parts of the work it is necessary to have artificial light, and it was thought that incandescent lamps would be just the thing for the job; but it was found that they would not stand a minute within any reasonable distance of the work. Some flying particle of sand, often too minute to detect the mark of it, would strike the glass, and it would immediately fly to pieces. The lamps are now used with a covering of muslin, and there is no more breakage.

The effect of the blast upon the nozzles and upon the sand itself gives a hint of the effect upon the metal. The nozzle is held nearly at right angles to the surface

to be treated, and an inch or so from it, and is slowly moved along by the operator. The effect is to clean the metal absolutely, to clean it in a way not to be compared with any other process. The sand blast for this purpose is not a cheap and rapid substitute for hand labor. It cleans the surface as it would be impossible to do it by hand. The metal is as free from rust, scale, flaw or speck as the side rod of a locomotive, or as a steel plate that has had a cut taken over it on the planer. The surface is not at all like either of these, however. There is no metallic lustre, or any suggestion of it. The appearance of the surface is quite peculiar and unfamiliar, and indeed the surface would not be recognized as iron or steel by those most used to the looks of common metal. It looks as if a painter had very carefully covered the surface with a coat of light gray or lead color.

In comparison with the surfaces of structural steel work as they usually are when they are painted, the surface which the sand blast leaves is a complete surprise to everyone—so much so that it has already turned the thoughts of many in a new direction. There has been much talk about the chemistry of paints, and not enough, perhaps, about the intimate attachment of the paint to the metal, and not enough precautions may have been taken to secure the latter. Before the sand blast was applied in this case, the part of the structure under treatment was first gone over with the clean air blast, and a large amount of material—12 tons, it is said—was taken off by that means. It was very evident that there was no intimate union of the paint and the metal surface. The covering came off like a shell, and often like a very loose shell.

The sand-blasted surface is as clean as though every spot had been actually machined, so that when the paint goes on it is very different from painting common rolling-mill surfaces, however fresh they may be. It is even suggested that there is less, after all, in the constitution of the paint than in the condition of the surface, although the former has been most insisted upon. Here upon the different trusses a dozen or more different kinds of paints are to be tried, and it would not be a very surprising result if several of them should show a nearly equal value, while it is hoped that all will give better results than have been obtained when so little attention has been given to the right preparation and absolute cleaning of the surfaces. In selecting the paints to be used for trial in this case, an attempt was made to secure typical paints, so that the various classes or kinds of paints would be represented, rather than several which might be almost identical except in name.

The paint is applied to the surfaces as soon as possible after the cleaning. The practice is to use the sand blast until the middle of the afternoon, and then to paint, on the same day, all that has been got ready. Atmospheric humidity has been very decidedly in evidence. It has been found that the use of the blast would sometimes leave the surface quite damp, and in a condition to rust quite rapidly, and for this reason, if for no other, it became advisable to cover it with a thin priming coat of paint as soon as possible. The two blasts in use clean together from 700 to 800 square feet per day. There is a man for each nozzle, one for the sand mixers, an engineer for the compressors, and several men to carry sand and sweep and carry away the refuse, besides the painters; so that the undertaking involves considerable expense. The entire operation is conducted with the greatest care and thoroughness, and careful record is kept of every detail by Mr. Evans, the engineer in charge, to whom we are indebted for information. The Tilghman sand-blast apparatus is used, this being in charge of Mr. John F. Honey, who also kindly afforded us every opportunity to see and understand the process.

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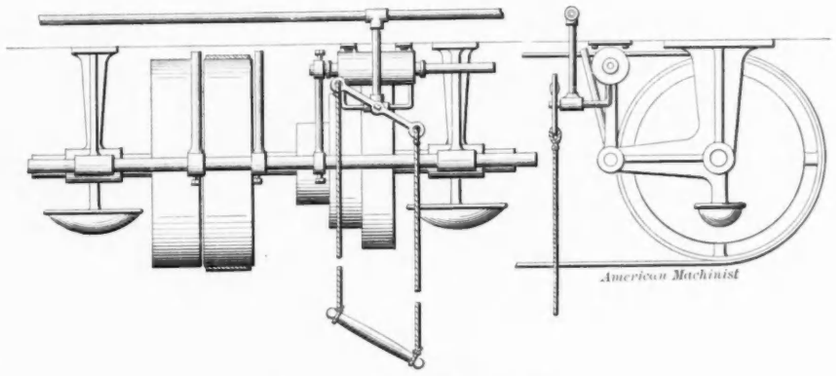
A Pneumatic Belt Shifter.

A pneumatic belt shifter should show several advantages over the venerable hanging down lever. The lever is generally more or less in the way, especially over a lathe, and it is not easy to place it where it can be most conveniently operated. The weight of the lever is usually ready to assert itself in slowly shifting the belt one way or the other from the position desired, and the lever in no case, unless by special devices, locks inself or is locked in any position. A pneumatic shipper moves the belt promptly in either direction, locks itself securely until another movement is required, and the means of operating it may be placed anywhere according to convenience.

The neat and simple shipper shown in the accompanying cut requires scarcely a word of explanation. The four-way valve, with the double-ended lever admits the compressed air to either end of the little horizontal air cylinder, driving the piston in either direction, and the shipper with it as required. As the pressure is constantly on the pipe it locks the shipper in whichever direction it may be thrown. The valve need not be overhead, as shown, but may be placed wherever most convenient and pipes may be led from it to the air cylinder, the length of the pipes making no difference whatever in the operation of the shipper. The driver, with but a slight modification, may be used to ship either way from a central position and operate both forward and backing belts upon machines which require it. For this service two equal helical springs are placed in the air cylinder, one on each side of the piston, their opposing action holding the shipper in the middle position when the air pressure is off; then the admission of the air will drive the piston either way as required. The cut is a reproduction from the drawing accompanying a patent recently issued to Henry A. Fergusson and Alexander J. Kline, Jersey City, N. J.



A PNEUMATIC BELT SHIFTER.

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One statement is being made in connection with the project of building a government armor plate plant which should not go unchallenged. Southern men are advocating the location of an armor plate plant at some point in the iron districts, on the ground that pig iron can be produced very cheaply there. In itself this is ridiculous, because the cost of the iron is an insignificant factor in the problem. But the advocates of a Southern location go further when they state that Southern basic pig iron has been used to manufacture armor plate steel at Pittsburg and at Bethlehem. As a matter of fact, not a single pound of Southern basic iron has ever been used in this branch of steel manufacture, and no armor plate maker would dare to use it. The greater part of the pig iron used is Swedish material of exceptional purity. We go a step further, and assert that the very best locality for the manufacture of armor plate, aside from strategic considerations, is that where the highest skilled labor is obtainable and is willing to live permanently. That certainly is not in any Southern iron town.—"The Iron Age."

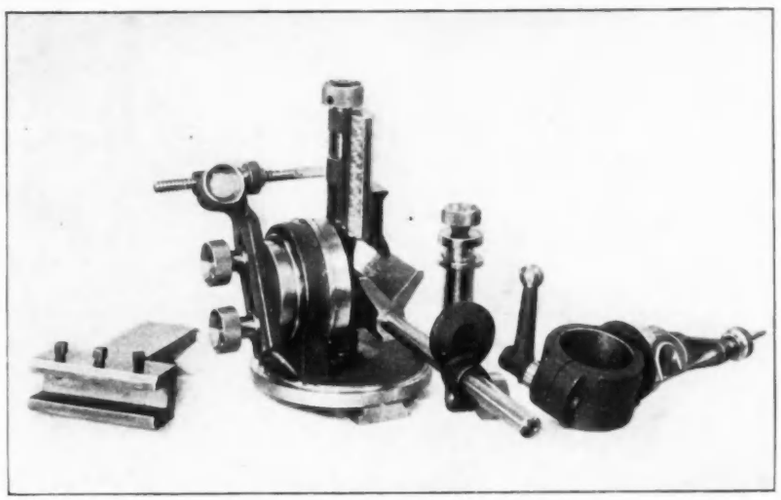

Fig. 1. ATTACHMENT TO GRINDER.

Improved Walker Tool and Cutter Grinder.

In previous issues (October 12, 1893, and May 21, 1896) we have published illustrated descriptions of the Walker tool and cutter grinder. It seemed to be about all that could reasonably be desired in such a machine, but nevertheless it has recently been improved by its original inventor, the improvement consisting in part of the "boiling down" process, and resulting, among other things, in reducing the number of attachments to a single one. This is shown in Fig. 1 and, as will be seen, it retains the characteristic universal V chuck for holding taper and straight shanks, but now has a graduated plate and movement in both the vertical and horizontal planes. This makes it capable of every possible adjustment.

At Fig. 2 we give a general view of the machine with all its attachments, including the countershafts, and at Fig. 3 a vertical section of the upper portion of the machine, showing its present construction.

A few of the improvements above mentioned are as follows: The vertical adjustment of the table has been discarded and the parts greatly strengthened by a broad and rigid support for the same at the edge of the column. The vertical adjustment is now obtained entirely by the movement of the grinder head, which is now operated by screw and graduated hand wheel, instead of rack and pinion, as formerly. Five-inch vertical adjustment is now obtained by 1-1,000-inch graduations. The swivel top of the carriage is now provided with screw adjustment. New center heads have been provided of a stronger form and the swing of the machine has been increased. A center rest has been added to the equipment, so that long work can be held with one end in universal chuck. The cross-feed screw is graduated in thousandths of an inch, and the carriage can be swung about the column as formerly, but is now set by degree graduations. All the parts of the machine are now disposed about the column and a place is provided to hold every separate part when not in use.

The machine is manufactured by the Norton Emery Wheel Co., Worcester, Mass.

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A large English contract has, it is said, been awarded to the Westinghouse Electric Company by the Metropolitan Supply Company, of London. The reports state that a lighting plant using three Westinghouse two-phase generators, of 2,000 horse-power capacity, will be direct connected to Westinghouse engines. The dynamos will resemble the four large machines now in course of construction for the Allegheny County Light Company. These have a field which, including spools, etc., weighs 242,000 pounds, with an overall diameter of 22 feet 7 inches. The armatures weigh 40 tons. The approximate total cost is about $450,000, and the date of completion is given as July, 1898.

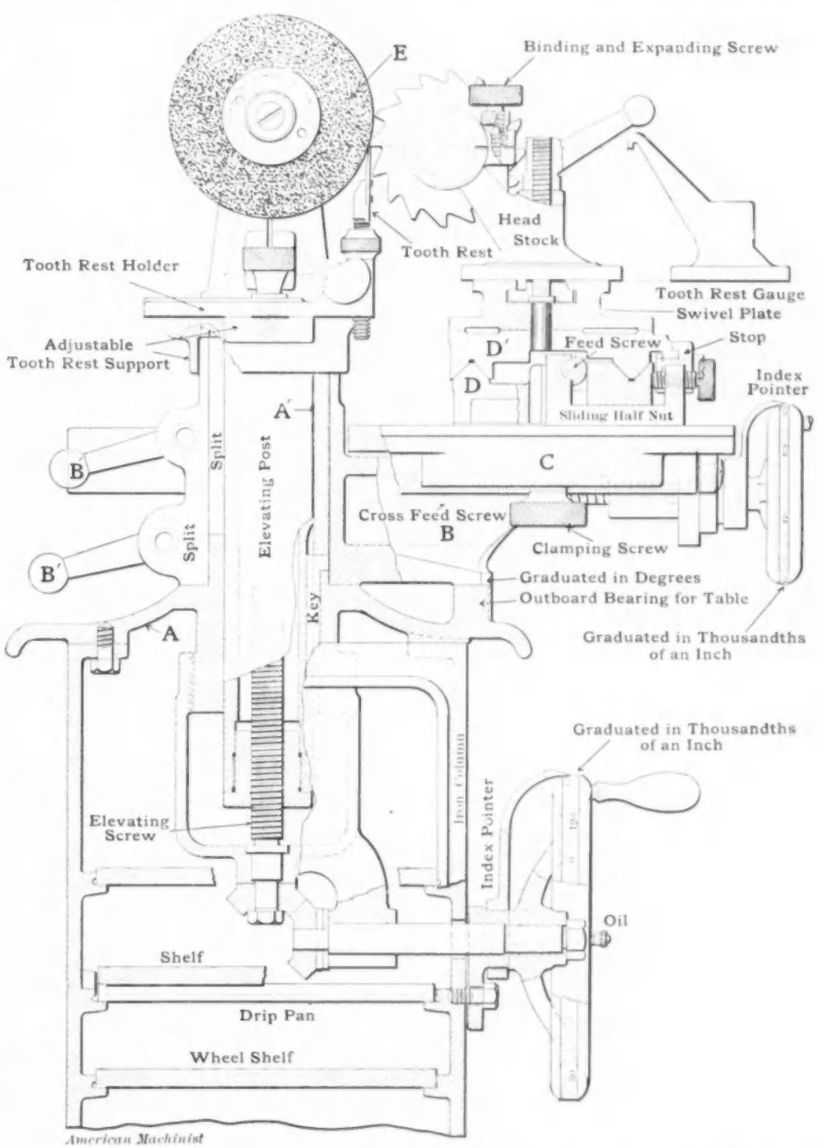


Fig. 3. VERTICAL SECTION OF UNIVERSAL CUTTER AND TOOL GRINDER.

Development of Iron Mining in the Lake Superior District.

We extract the following notes from a paper read by Mr. D. H. Bacon, of Soudan, Mich., before the American Institute of Mining Engineers. The facts are so striking as to be of general interest on the principle given in the first paragraph:

Nearly all men are too busy with their own affairs to keep informed of the progress in other lines. From time to time we read statistics showing the development in some industry that astonish us; but the feeling of surprise soon fades, to be followed by others that likewise pass away. A short resumé of what has been done in one line may be of interest.

Down to late in the fifties the ore product of Lake Superior was handled over a mule tram-road to Marquette; now seven railroads serve the shippers. Down to nearly 1870 a 700-ton ship was an enormous craft, the loading of which required two days; the unloading being seldom accomplished in that time. In 1871 the largest ore barge carried 1,050 tons and made twelve trips per season. Now the cargoes reach 5,000 tons, the loading requiring less than three hours, and the unloading ten hours. The annual shipments have grown from a few thousand to 10,000,000 tons, and the ability of the mines to produce is not taxed. Lake freights are at one-eighth, and rail freights at one-quarter, of early prices.

The deeper waterways, commodious locks and large ships of to-day are in a greater measure due to the movement of ore than to any other cause. Great savings have been made in each detail of each department. The only item of cost that has not been lessened, I am glad to say, is the money paid to men. Wages, measured by what they will buy, are as high now as at any time past, unless it was a time of feverish activity.

As illustrating the cheapening that has been effected, ore is to-day sold at Lake Erie ports for $1 per ton less than in early times it actually cost to mine it; and this is done without loss, and further economies may be expected. Young men remember sales of ore in Pittsburg at $18 per ton, or about the present price on rails.

Nitroglycerine and power drills have done more to reduce cost than any other two improvements. In 1871 a drift was driven at the Cleveland mine at a cost of $100 per foot. Now the cost would not exceed $16. In one case men were harnessed to a derrick-sweep. Heavy rains were nearly always followed by a few days of idleness and the pumps were expected to freeze every cold night.

A look at the past may tickle our vanity, but our interests are in the future. Can we maintain the present output? Can we increase it? For how many years can buyers depend upon Lake Superior for their supply? With the low prices that are here to remain, it is more than ever difficult to estimate the annual consumption. Speaking of the several ranges as one, the acreage of known ore is but a small part of the area that may contain ore. Discoveries are still being made in the Marquette district, the exhaustion of which was expected twenty years ago. And I may say, in passing, that the known ore under the bed of Lake Angeline is four times as great as was all the known ore in all of the mines of that country at any time prior to 1887.

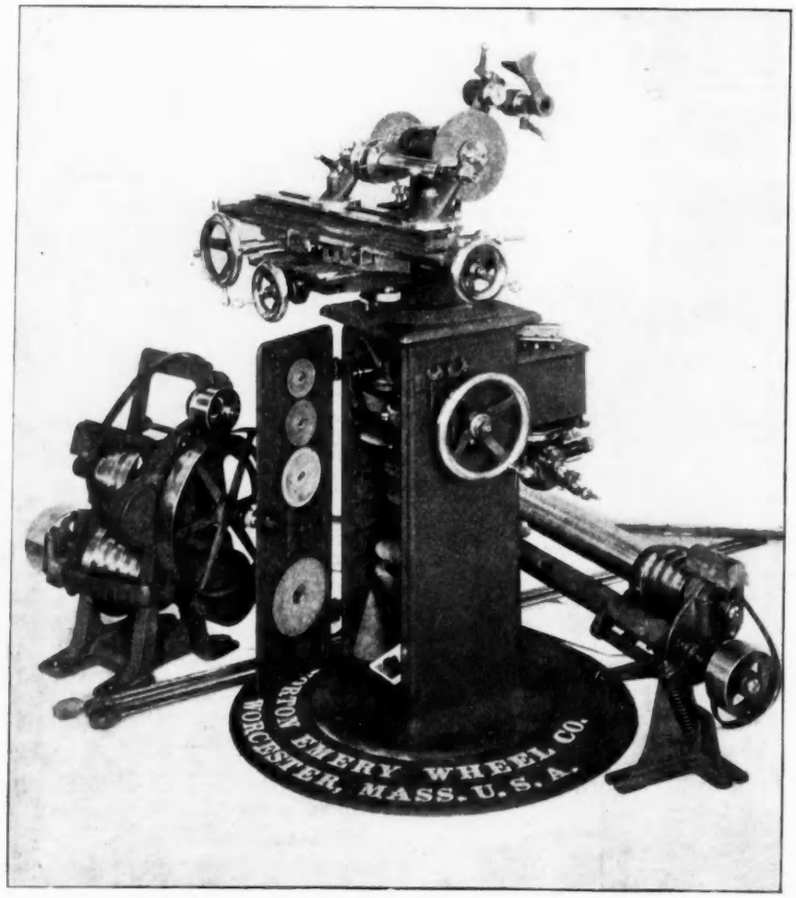


Fig. 2. IMPROVED WALKER TOOL GRINDER.

Air Resistance.

"The Engineer," of London, illustrates a queer looking French locomotive, designed evidently as some experimental machines in this country have been to reduce air resistance. Regarding this, our contemporary says: "The remarkable contour of the locomotive we illustrate on this page needs no comment. From time to time persons forget that the end friction of elongated bodies moving at high velocities is practically negligible when compared with the side friction, and attempt to reduce resistance by providing the body with a pointed beak or prow, even at the expense of increased surface. It is true that projectiles are pointed at the leading extremity, but it has been shown by experiment that the gain in velocity from so doing is only slight. The projectile, however, flies more steadily, and it is therefore pointed. An elongated projectile with an hemispherical end, but tapering towards the rear extremity, is about as good for flight as any. The porpoise very closely follows this shape, and perhaps the great speed attained by this animal is dependent in large measure upon it."

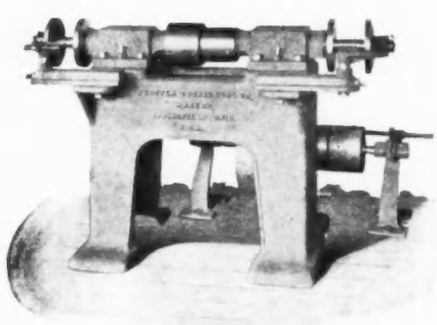
Electrical Engineering at Union University.

We have received from Union University, Schenectady, N. Y., a circular of information regarding the new course of instruction in electrical engineering in that institution. Attention is properly called to the advantage of location in the same town as the great works of the General Electric Company. The co-operation of that company has been obtained, which, if properly used, will be of great advantage to the students.

The relative merits and demerits of English and American bridge-building practice are being discussed in "The Engineer," London, and about the clearest idea one can get from this discussion is as to the desirability of eliminating so-called patriotism from discussions of purely engineering matters.

Improved Emery Wheel Grinder.

The impression has been and perhaps still is entirely too common among mechanics that almost anything will do for an emery grinder and the choice of them has been usually solely a matter of price. Recently, however, more attention has been given to them with the result of introducing some decided improvements in their construction. Some of these we have illustrated in our previous issues and we show herewith a new grinder which possesses novel features in its arrangement of the boxes and means for oiling them. As will be seen by reference to the longitudinal and cross-section of the journal bearings there is an oil hole at the side which is opened by rotating a cap fitted to the projecting tube as shown. Rotation of this cap opens the oil hole at the side to permit the introduction of the oil-can spout and this orifice is at a somewhat higher level than the bottom of the journal. The oil thus first descends and fills the large cavity below, and from it rises through the two small holes shown in the longitudinal section to the journal where it is distributed by the oil channel shown in the cross section. It is found that by thus arranging the bearing any emery which may possibly get into the oil is deposited as sediment in the oil chamber and does not rise with the oil to the journal, tests showing that even when



EMERY GRINDER.

emery is purposely introduced with the oil it does not reach the journal bearing. In other respects as will be seen the journal is well protected, the cast cover, secured by a single screw at the top, giving not only a neat finish to the machine, but also better protecting it from emery and dust.

A great deal of emery, of course, can accumulate in this chamber before there will be danger of its reaching the bearing, probably more than is likely to enter during the life of the machine, but in case it is desired to clean out this chamber it can be done by removing the screw plug seen just below the oil cups in the perspective view of the machine.

The two pulleys shown on the spindle are entirely separate and can be shifted on the shaft to take up endwise motion. The machine is so designed that it can be bolted either from above or below, as may be most convenient. It has a shaft 2¼ x 57 inches long with bearings 12 inches long, is designed to use emery wheels 30 inches in diameter and weighs complete 1,150 pounds. It is made by the Webster & Perks Tool Co., Springfield, O.

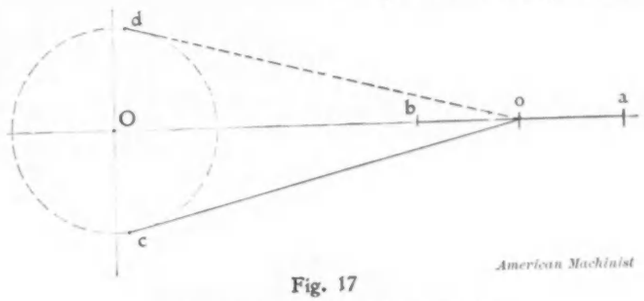


Fig. 17

THE CONNECTING ROD ERROR.

The Locomotive Link Motion—VI.

BY F. A. HALSEY.

THE ERROR DUE TO THE ANGULAR VIBRATION OF THE CONNECTING ROD.

As has been explained, the offset of the saddle stud shown in Fig. 16 is introduced to compensate errors and bring the cut-off at the same point in both strokes. Of these errors the first in order of description, but the last in order of importance, is that due to the angular vibration of the connecting rod, the nature of which will be apparent from Fig. 17, which is a skeleton diagram of the cross-head slides, connecting rod and crank pin. It is obvious that if the connecting rod be disconnected from the crank pin and the center of the cross-head pin be placed at the center of the slide *o*, and the connecting rod end be then swung through an arc passing through the center of the shaft *O*, this arc will cut the crank pin circle at points *c d*, which points do not occupy the quarter positions of the crank as they would do if the Scotch yoke were used in place of the connecting rod. The result of this error is that during the rearward movement of the cross-head from *a*, the crank lags behind its correct position, while during its forward movement from *b*, the crank runs ahead of its correct position—these errors existing at all points but being at a maximum at or near the half stroke. The study of the effect of this action upon the link is most easily made by separating it from the other errors, and as there is a similar error due to the angularity of the eccentric rods, the study of the connecting rod error requires that the eccentric rod errors be gotten rid of by assuming the horizontal movements of the eccentric rod pins in the link ends to be truly the same as those of the eccentric centers. This assumption of no angular swing on the part of the eccentric rods, involves the further assumption of a straight link. Similarly, the elimination of the error due to the offset eccentric rod pins, requires

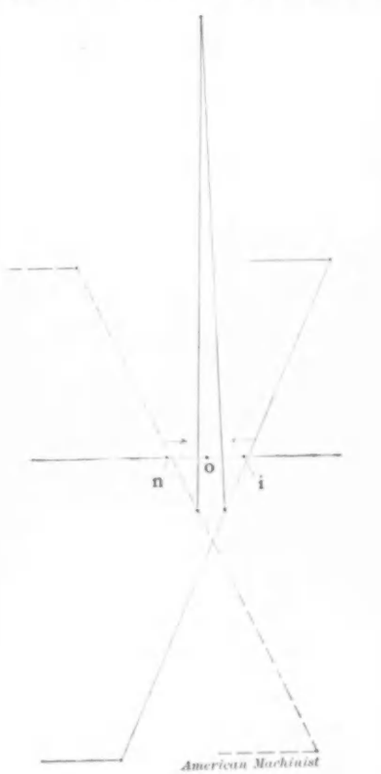
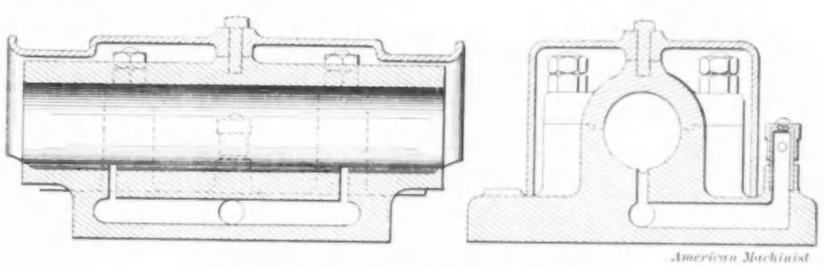


Fig. 18

EFFECT OF CONNECTING-ROD ERROR ON THE CUT-OFF.



JOURNAL BOX OF EMERY GRINDER.

the location of these pins to be on the link center line. Fig. 18 has been made in accordance with these requirements, and shows the link positions for the crank positions of Fig. 16, with the errors due to the connecting rod included.

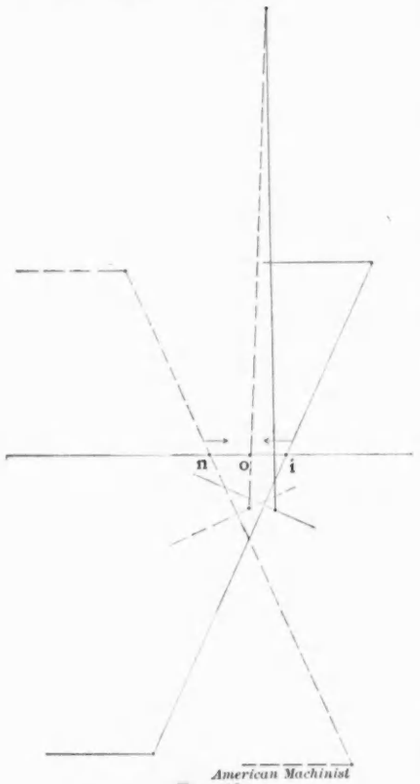


Fig. 19

CORRECTION OF THE CONNECTING-ROD ERROR.

These errors in the position of the crank are obviously repeated in the eccentrics and link, that is for the rearward movement of the piston, when the crank lags behind its proper position, the eccentrics and link will do the same, and cut-off will not have occurred at the point desired. For the forward or return stroke the conditions are reversed, the crank, eccentrics and link being ahead of their correct positions, and cut-off having already occurred at the desired point of the stroke. This condition of things is shown in Fig. 18, in which the cut-off points *i* and *n* of Fig. 16 are repeated. The arrows show the direction of the motion, and it will be apparent at once that the full line link has not reached the cut-off point, while the dotted line link has passed it. It is clear that these errors could be corrected by slightly raising the full line and dropping the dotted line position, and to do this only requires that the link stud be placed outside the link center line, as shown in Fig. 19, and this adjustment of the stud will be seen to be the exact reverse of that actually followed in locomotives—demonstrating the position here taken, that other errors override that due to the connecting rod.

THE ERROR DUE TO THE ANGULAR VIBRATION OF THE ECCENTRIC RODS.

It is apparent at first glance that the action between the eccentrics and link ends is in a sense similar to that between the crank and cross-head. There is, however, an important difference. Reference to Fig. 17 will recall the fact that with the connecting rod, the error is zero at the centers and is at its maximum near the quarter, but this is not the case with the eccentric rods, because the paths of the link ends do not pass through the center of the shaft. Referring to Fig. 20, it will be seen that the average angle between

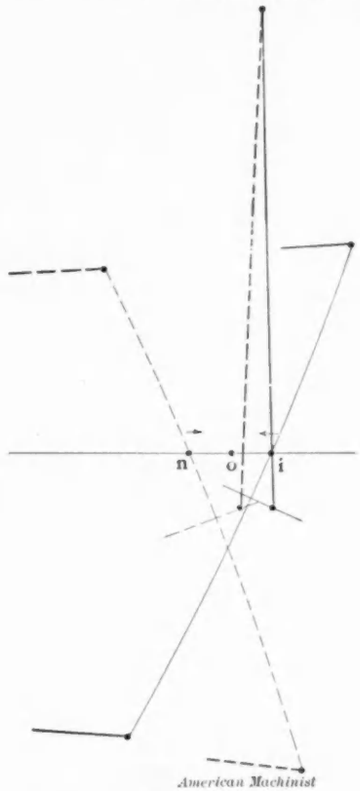


Fig. 22

CORRECTION OF THE ECCENTRIC-ROD ERROR.

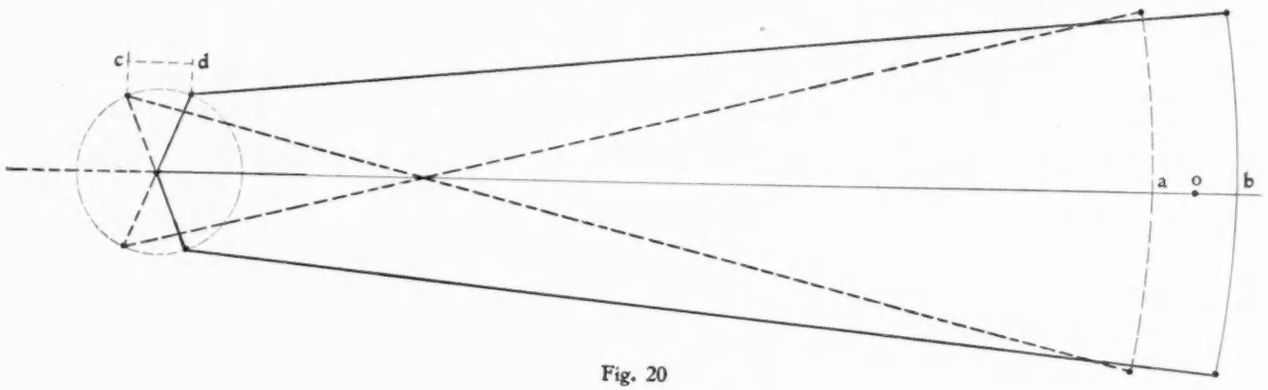


Fig. 20

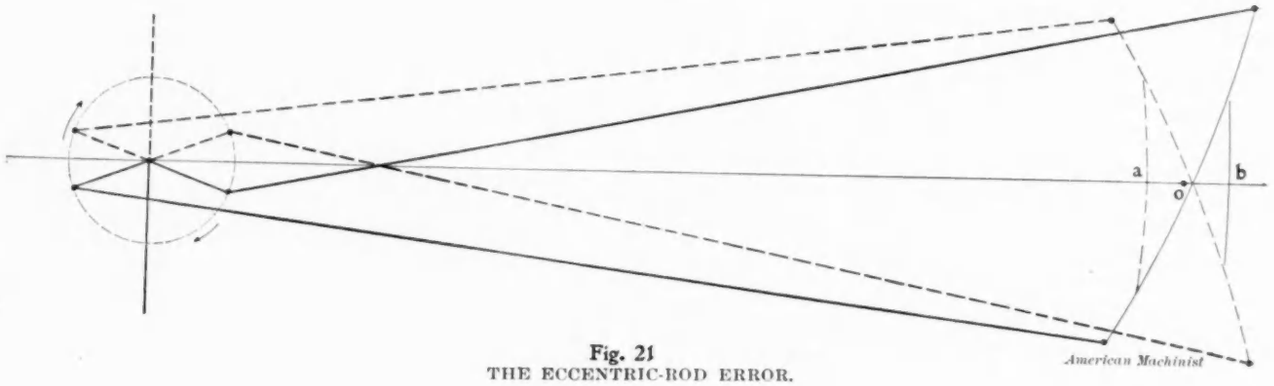


Fig. 21

THE ECCENTRIC-ROD ERROR.

the eccentric rods and the center line is smallest in the full line position, and that this angle increases during the entire semi-revolution and becomes a maximum at the dotted line position. In other words, the distortion, instead of increasing to a maximum for 90 degrees of rotation and then decreasing again, really increases to a maximum at 180 degrees of rotation. This increasing angle of the rods increases the movement of the link, and whereas the stroke of a cross-head is exactly twice the length of the crank, the movement of the link center *a b* is materially more than the distance *c d* (in the case of this diagram nearly 50 per cent. more). Starting at *b*, the error in the position of the link

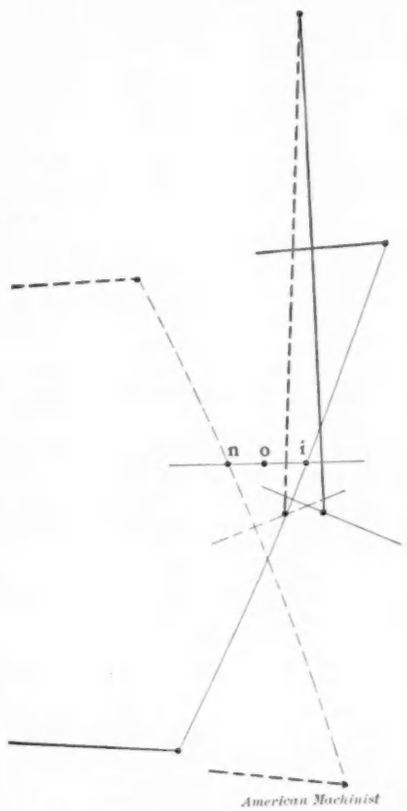


Fig. 23

CORRECTION OF BOTH CONNECTING AND ECCENTRIC ROD ERRORS.

center steadily increases during the movement toward *a*. The errors being greatest during the second quadrant of rotation, they increase the movement more during the second quadrant than the first. In other words, the movement of the link center is greater during the second quadrant than the first. Consequently if a diagram like Fig. 21 be laid down, it will be found that the first quadrant of movement from the full line position of Fig. 20 to that of Fig. 21, leaves the link center appreciably to the right of the neutral point *o*, and similarly a quadrant of movement from the dotted line position of Fig. 20 to that of Fig. 21, will carry the link center to the right beyond *o*, and the same is true of any other angle of rotation. In other words, the movement of the link center toward the left is too slow, while the movement to the right is too fast. The rocker reverses these movements on the valve, leading to too slow a movement to the right with too late a cut-off on the forward port or rearward stroke, and too fast a movement to the left with too early a cut-off on the rear port or forward stroke. These effects are obviously in the same direction as those due to the connecting rod error, and the two are, in fact, added together in an actual locomotive. The correction of this error obviously requires an adjustment of the saddle stud in the same direction as that made to correct the connecting rod error. Fig. 22 shows this in amount, this diagram having been constructed with the connecting rod error eliminated, and the offset of Fig. 22 will be seen to be greater than that of Fig. 19 for the connecting rod alone. Fig. 23 shows the offset necessary to correct the errors of both connecting and eccentric rods—the amount being approximately the sum of the offsets of Figs. 19 and 22.

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A Simple Remedy for Burns.

Doctor Thierry, of the Charity Hospital at Paris, has found per chance that picric acid is a curative for superficial burns. He relates the discovery as follows: " My specialty at the hospital was surgical operations, and as I used picric acid as an antiseptic, my hands were constantly impregnated with its solution. Two years ago, while lighting a cigarette, a little bit of phosphorus fell upon my hand. I felt nothing instead of the intense pain I naturally expected. Later on, while sealing a letter, some melted wax fell on my hand; result, a light trace of burn, but no pain. Searching for the cause of this immunity I found that I owed it to the picric acid which contracted the tissues of the skin. Since that time, after experimenting in different hospitals, I have obtained convincing results. The pain is almost instantaneously suppressed after bathing the wound in a solution of this acid; the sores and blisters are prevented and the cure is completed in four or five days. Picric acid is neither caustic, toxic nor irritating and has no smell. Its only inconvenience is to give a yellow tint to the skin, but by washing the place with a solution of boric acid, the stains will be removed."

Doctor Thierry thinks this discovery would render great service if applied in mines, foundries, smith shops, etc., where burns are frequent accidents. And as picric acid acts efficaciously when applied immediately after the accident, it would be wise to have a solution always ready for use. In large shops a barrel could be used as a tank and filled with a 1 to 75 solution (1 pound of picric acid to 75 pounds of water). If, for instance, a jet of steam would scald a workman, he could be quickly placed in the barrel and after a few minutes taken out and dried. This would prevent the suffering of great pain, too often followed by death, and would insure a prompt and certain recovery.

The above was translated by the writer about one year ago from the "Bulletin de l'Industrie Française," but as many so-called "good hints" are published which prove afterwards worthless, it was laid aside as a matter of little importance. But recently, while calling at a friend's house, I found the family in distress, for, while attempting to light the gas in a hurry, my friend had struck a match against the side of a half open match box, and a spark had ignited all the matches at once, which severely burned the hand in three places. The pain was intense, and as I came in almost immediately after the accident happened, remedies had not yet been applied. Remembering the alleged qualities of the picric acid, I went out and quickly brought the chemical, filled a small pan with water and added some of the acid to it. It was scarcely necessary to observe the proportion given (1 to 75), for when the water is saturated, the acid deposits at the bottom, so that the proportion is self-established. The wounded hand was dipped in the solution and kept there for four or five minutes after which the pain being greatly reduced, a bandage saturated with the solution was applied and over this a piece of linen was loosely wound. In less than a quarter of an hour the pain had completely subsided. The treatment for the three days following consisted in washing the wounds three times a day in the same solution. The hand regained its former appearance and condition only after a very long time, say about three weeks; this is easily understood when considering that the skin had been destroyed and that its growth is very slow. But at no time was there in the wounds, either inflammation, pus or water deposits. And to-day no trace of burns is discernable. I feel sorry now that the above information has not been sooner published, it would perhaps have proven very useful; but it does not come too late, for accidents are of frequent occurrence.

ALBERT E. GUY.

New York.

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The burden of the evidence so far adduced regarding the recent fall of an elevator in the American Tract Society Building, this city, indicates that the fall was caused, not by a defect in the elevator, but by the ignorance and recklessness of one of the men who undertook to doctor it, and met death as his share of the penalty.

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The "Pall Mall Magazine" for September contains an interesting article by Angus Sinclair, editor of "Locomotive Engineering," entitled "American Express Locomotives."

A New Oil Can.

Our engraving shows the details of construction of a new oil can recently put on the market by Robt. McVicor, of Denver, Col. The can is of the class known as valve cans, the flow of oil being controlled by a valve in the spout operated by a thumb piece. In most cans of this kind the valve rod is crooked, making a turn in the can, and coming up through the side with a thumb button on its end. This form of valve requires packing around the thumb-piece rod, and, as a rule, the spout is soldered on. There is also a filling plug above the handle, which

A NEW OIL CAN.

is partially opened to form a vent when the can is in use.

The can shown has no packing, gaskets or filling plug. It is filled or emptied by unscrewing the spout at the body of the can.

The valve rod and spring are secured in the spout and come away with it.

The vent is the new feature; this is a chamber in the can, always open to the atmosphere by means of the hollow shaft that operates the valve by means of a crank on its inner end. This shaft is a tube within a tube, the outer one being soldered fast to can body and vent chamber.

The movement of the valve rod, by means of the thumb piece, not only lifts the rod and the valve at top of spout, but opens the vent chamber to the interior of the can.

It will be seen that such a can is tight, no matter in what position it is placed. The flow of oil is entirely within the control of the operator, and the spout can be put in any awkward or difficult place before oil is allowed to run, and can be stopped before removal; this is important in such service as that on locomotives. The entire can, spout, tap and all, is made of No. 22 B. W. G. steel; the unions are of brass, with ground joints.

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Letters from Practical Men.

Get the Air Compressor.

Editor American Machinist:

If compressed air is to be used in the shop for any purpose, the first thing, of course, is to get an air compressor. This initial expense, although not usually a large one, seems to be an effective barrier in too many cases to the introduction of a class of tools and facilities of the highest usefulness and convenience. The fact of the presence of the air-brake pump in the railroad repair shop has put nearly every such shop in the country far in advance of the general machine shop that is without railroad affiliations. In railroad shops the use of compressed air is almost universal, while in the large class of shops where the air-brake pump is not ex-officio, the use of compressed air is still the exception rather than the rule. Shops which are otherwise up to the times, and ready enough to try anything in the way of improved drills, taps, lathe or planer tools, or anything that can be put right in and tried independently, are completely barred from the use of compressed-air operated appliances by the effort of will required to order and install the compressor. The railroad shops, thanks to the air-brake pumps, have learned to appreciate the compressed-air service, and now they are becoming the best customers of the compressor builders for permanent and economical compressing apparatus.

The foundries also are rapidly leaving the machine shops behind in the use of compressed air, although in the latter the uses to which the air may be applied are actually more numerous than in the former. The three most prominent uses to which the air is put in the foundry are, however, relatively more important than any three uses as yet developed for the air in the machine shop. For general hoisting, for the operating of molding machines and for cleaning castings, the air is a vast improvement over former methods, doing the work both better and cheaper. For neither of these uses does the air find itself a competitor of electricity, except for traveling cranes and for geared and revolving drum hoisting. For the direct-acting vertical hoist, compressed air is alone in convenience, speed and general adaptability.

Of power hoisting in a large way in the machine shop it would seem to be a waste of words to speak, when in so many shops the traveling crane is the central idea around which everything has been designed and erected. This is not necessarily, or, as far as we have gone, probably, a compressed-air machine, but the hoists for individual machines, for trolleys to run around the shop, and for such service compressed air is alone.

Hoisting is essentially a pulling operation, yet the air service adapts itself quite as readily to pushing or to pressing, a very frequent and necessary operation of the shop. We should use the press more than we do, and we would use it much more than we do if we had it. Curiously enough, one of the places where compressed-air presses could do the most good to-day is in the shops where they build or repair electric machinery. They don't have air-brake pumps hanging around street railway shops, or they would have air-operated presses in common use. As it is, you may go into one of those shops and see them putting a commutator on to an armature with a 12 or 14 pound sledge. No wonder they have trouble with their wire works. A writer who dropped into one of these shops the other day tells how he watched the operation of changing armatures. He noted that the man was very careful to place a cushion under it to prevent injury, but when it came to removing the pinion, he whanged at it with a big sledge. This is not general practice, and was only mentioned because so bad; but it suggests the place where the press is very much needed. Driving things with a sledge has always been a brutal practice, and it ought to be getting scarcer.

Straightening presses and presses for mandrels large and small, and operated by compressed air, should be an every-day sight, and should be found anywhere and everywhere, instead of being so scarce that you don't know where to look for them. The press does the job so neatly and so easily, and by the gage tells you so surely what you are actually doing, that it seems strange that anyone should need to say anything in its favor. I know there are hydraulic presses, and I know what they will do, and they have their special work that I would gladly let them do. But, after all, they are heavy and slow, and then there is the water. The pneumatic press is lively and ready, and is never out of order.

After the pulling and pushing operations, we next have the twisting or turning to do. Here is where the motor comes in, and here is where electricity begins to come in. The trouble with electricity is that it is too lively, and you have to gear it down, while the portable air drill or tap goes at the right gait from the start, so that it is not so heavy to

handle and is more ready to take right hold of the work. If a portable motor is needed for drilling or tapping, there are a number of compressed-air motors in the market, and it is almost absurd to ever think of doing any of those things by hand.

I know all this is apparently in the interest of laziness; it is making things easier for a fellow. That may be so, but it certainly is more decidedly in the interest of cheapness, quickness and precision. Because a thing is made cheap and easy to do, there is no longer any necessary presumption that the work is slighted. It is more likely to be done better. It is becoming every day more difficult for a skilled workman to find any regular hard muscle work to do, like the old-fashioned chipping and filing and ratchet-drill work, and all that sort of thing.

A fourth operation that compressed air stands ready to do, is to take the place of the hand hammer. There is no chipping or caulking, such as used to be done by hand, that cannot now be done better by pneumatic tools. There are also a lot of odd jobs too numerous to mention, that compressed air is found handy for in the railroad shops, and that it also should be used for in most other shops; but the first thing to do is to get the compressor. After the compressor is got, it will take care of itself, and will need no advocate or defender. Compressed air, when it once finds employment, is never discharged from service.

TECUMSEH SWIFT.

▲ ▲ ▲

Is It Perpetual Motion?

Editor American Machinist:

There is to be seen at the Tennessee Centennial and Industrial Exposition a moving wheel, which revolves slowly and seems to be impelled by a power which is exerted within itself. It is the invention of a Tennesseean, Mr. W. J. Gladish, of Chattanooga.

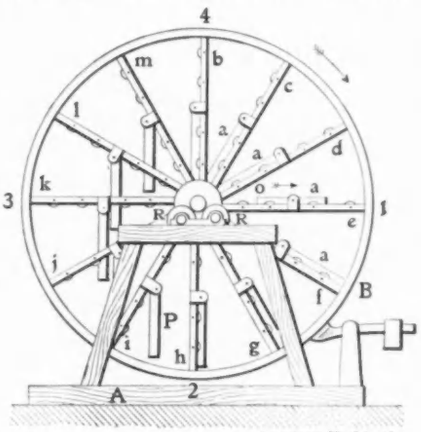
A sketch is inclosed showing a side elevation of this wheel, as it appears to visitors. It will be seen that its construction is so simple that no extraneous force could be employed without detection.

The wheel is constructed chiefly of wood; it is 12 feet in diameter, and has 12 double arms. Those numbered 1, 2, 3 and 4 are in the same plane, and each succeeding set of four occupy an adjacent plane. On each of these double arms is fitted a thin steel tube about 2 inches diameter and 3 feet long. These 12 tubes contain 5 pounds each of mercury. The wheel revolves in the direction of the arrow. On arm No. 1, one of these tubes is shown midway between the hub and rim. When the end *O* reaches the clip at the center of the arm, it engages with a pin by means of hooks at *O*. Here the tubes rest, as they consecutively reach the point No. 1, and remain so until they reach point No. 2, when they begin to swing away from the arm, as seen at *P*. It will be seen that the mercury changes from the inner to the outer end of the tube at position No. 1, and remains here throughout the whole revolution; but in the meantime the outer end of the tube becomes the inner end, when No. 4 is reached. The friction rollers *R R* run on ball bearings, so that friction is reduced to a minimum. In order that shocks may be prevented, and the motion of the wheel be made regular, a brake is applied at *B;* the weight of this lever is adjusted to the desired motion.

If any of your readers think it worth the trouble to calculate the amount of impelling and retarding forces at work in this wheel, I am sure there are many who would examine their work with interest.

QUIRK.

[It is not our practice to notice perpetual-motion schemes, but this is one which turns up in one form or another with such regularity, and which having now appeared at a prominent exposition,



American Machinist

PERPETUAL-MOTION SCHEME.

it may be worth while to show the fallacy at the bottom of it.

The sketch shows the weight on arm 1 at the point of change, and we will therefore suppose the wheel to be turned forward by half the space between the spokes, or 15 degrees. We will also assume the radius of the pin from which the tubes hang when on the left-hand side of the wheel to be 5 feet, and the radial movement of the center of gravity of the tubes between positions occupied on arms *d* and *f*, to be 2 feet. Calculating the lever arms of the various weights, we have for the right side of the wheel:

For arm *b*,	4 X sin. 15° = 4 X .25882	= 1.03528
" " *c*,	4 X sin. 45° = 4 X .70711	= 2.82844
" " *d*,	4 X sin 75° = 4 X .96693	= 3.86772
" " *e*,	6 X sin. 75° = 6 X .96693	= 5.80158
" " *f*,	6 X sin. 45° = 6 X .70711	= 4.24266
" " *g*,	6 X sin. 15° = 6 X .25882	= 1.55292
	Total, ...	19.32860

Proceeding in the same way for the left side, we have:

For arm *h*,	5 X sin. 15° = 5 X .25882	= 1.29410
" " *i*,	5 X sin. 45° = 5 X .70711	= 3.53555
" " *j*,	5 X sin 75° = 5 X .96693	= 4.83465
" " *k*,	5 X sin. 75° = 5 X .96693	= 4.83465
" " *l*,	5 X sin 45° = 5 X .70711	= 3.53555
" " *m*,	5 X sin. 15° = 5 X .25882	= 1.29410
	Total, ...	19.32860

These will be seen to balance exactly, as, indeed, an inspection of what has been done will show they must. It is not difficult to imagine several methods by which the machine could be driven. We suggest to our correspondent that he release the brake and see if the machine increases it speed.—Ed.]

▲ ▲ ▲

Equal Spacing of Holes—Correct Index Plates.

Editor American Machinist:

I am very much interested in Mr. Baxter's method for spacing holes in a ring jig. It seems to me doubtful if the result would be the final squaring of the reamer, as he claims; but it seems plain that the equal spacing of the holes is a necessity of the process, and it would not be difficult to add a device for squaring the reamer. Now, given such a device, with short holes and a liberal sized stocky reamer, why would not Mr. Baxter's plan accomplish what many have tried to do, and failed—originate a mechanically correct index plate? By doing this cheaply, the plan would enable correct master gears to be cut directly from the index plates, without intervening gearing, and so provide for a great improvement in the accuracy of gear-tooth spacing. The usual methods of indexing, depending as they do on incorrectly divided index plates and gears, simply travel round and round in a circle and perpetuate errors. Tooth profiles were long ago brought to a degree of accuracy which is all that can reasonably be desired, but the accuracy of spacing is far in the rear, and these errors in the spacing of the change gears reproduce themselves in every screw cut on a lathe, as well as every gear cut on a gear cutter and every other piece of work in which the accuracy of gears is a factor. With correct master index plates and master gears which they would render possible, the accuracy of all change gearing for machine tools could be greatly increased, with corresponding effect on the work turned out by those tools. Mr. Baxter's plan may, it seems to me, have far-reaching results. The accuracy of index plates is directly or indirectly a factor in a far wider range of work than we are accustomed to think.

C. O. GRIFFIN.

▲ ▲ ▲

Cutting Helical Teeth.

Editor American Machinist:

Some time ago, in your question and answer column, a question was asked by "B." as to the way to get the face angle of a "spiral" mill, and I have thought that the following might prove interesting to many of your readers.

I choose two extremes from several examples of hobs and taps which I have had in figuring for the angle for pitch of teeth, face of helix or spiral, and proportion of gear trains when beyond the

capacity as given in table of spirals accompanying the milling machine.

(1) Tap diameter $1\frac{7}{16}$", pitch $\frac{1}{4}$", angle 13° 52', and pitch to one turn = $12\frac{5}{32}$".

(2) Hob diameter $5\frac{1}{16}$", pitch $1\frac{1}{2}$", angle 5° 27', and pitch to one turn = $164\frac{1}{2}$".

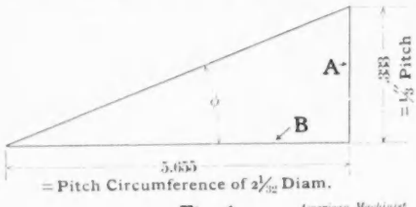


Fig. 1 *American Machinist*

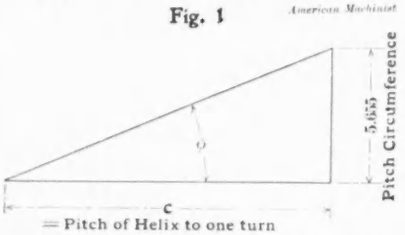


Fig. 2 *American Machinist*

Should enquirer "B's" "spiral mill" be near that of No. 2, the method as given in the answer, which was, "to construct a triangle whose vertical should equal the circumference of the pitch line, the length of the base from the apex made by the angle previously found being the pitch of the spiral or helix," would be somewhat difficult, having the great length due to the small angle from so large a diameter and pitch; he would probably find the following method more convenient. Taking as example: Hob diameter $2\frac{1}{32}$", pitch $\frac{1}{3}$", construct, as in Fig 1, a triangle, figuring the base to be the circumference of the pitch diameter, and the vertical line the pitch; then

$\frac{5.655}{.333} = 16.965$, the cotangent of angle ϕ.

Several methods are later given to find this angle. Construct triangle, Fig. 2, figuring the vertical as pitch-line circumference 5.655, and obtaining length of base in the product of the hight of the vertical line times the cotangent of angle ϕ, the angles of Figs. 1 and 2 being the same, the cotangent will be — 16.965, as found in Fig 1, and $C = 5.655 \times 16.965 =$ nearly 96 inches.

Referring to the table of spirals accompanying the Brainard or similar milling machine, we find the example beyond its capacity and the gear trains of the machine, making it necessary to figure a compound gear train with a probable new large gear or small pinion.

Fig. 3 shows the train on the Brainard machine. Carriage C must travel, by means of the screw, the required 96 inches to one turn of the hob (supposing a hob of such length).

Operation: $\frac{\text{Pitch required}}{\text{Pitch of screw}} = \frac{96}{\frac{1}{4}} = 384$

and $\frac{\text{teeth of worm wheel}}{384} = \frac{40}{384} = .1042$

the ratio R to go in the compound gear train.

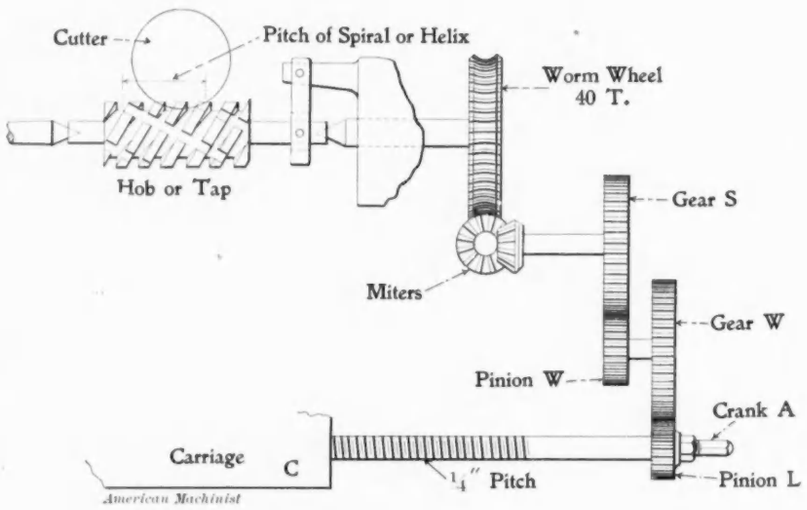


Fig. 3
HELICAL MILLING.

PROPORTION OF WHEELS FOR SCREW-CUTTING LATHE.

R = Ratio of lead screw to screw desired,
S = Wheel on spindle,
W = " driven by S, } stud wheels or
W^2 = " " by W, } stud and pinion.
L = " " by W^2 — on the lead screw, then

(1) $\frac{S\,R\,W^2}{W} = L$ (2) $\frac{S\,R}{L\,W} = W^2$

(3) $\frac{S\,R\,W^2}{L} = W.$

Taking formula No. 1 of the proportion of wheels, apply the ratio .1042, and using as far as possible the gears of the machine and other specials as made from time to time, a suitable train may be obtained.

Operation: $\frac{S\,R\,W^2}{W} = L$, and taking

$\frac{S}{72} \times \frac{R}{.1042} \times \frac{W^2}{64} \times \frac{24}{W} = \frac{L}{20}\,T$, gives 20 teeth for pinion on lead screw.

To find the angle ϕ for setting the carriage in relation to the cutter:

1. Refer to table of tangents and cotangents in any engineer's pocket-book.

2. Lay out to scale, Fig. 1, and measure the angle with a protractor.

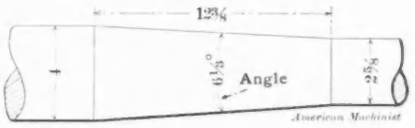
3. Find the ratio of the sides A into B (in this case = 1 to 17); referring this to table of cone angles, we find 1 to 17 = 3⅗°.

4. Where greater accuracy is not required, put the tap or hob in place, and, with the gear train as found, turn crank A, allowing the cutter to mark the work, using the line and the side of cutter in sighting to the eye while adjusting the carriage to the angle.

The above methods will prove satisfactory, and the result, after the first attempt, is obtained very quickly.

TABLE OF CONE ANGLES.

When table is used for setting the compound rest of the lathe, only one-half the given angle will be taken.



4" minus $2\frac{5}{8}" = 1\frac{3}{8}$ and $\frac{12\frac{3}{8}}{1\frac{3}{8}} = \frac{99}{11} = 1$ in 9.

Refer to column of tapers and opposite is the angle in degrees—take ½ of this.

Taper of 1 in	Deg.	Taper of 1 in.	Deg.	Taper of 1 in.	Deg.
2	$28\frac{1}{2}$	6	$9\frac{1}{2}$	14	$4\frac{1}{2}$
$2\frac{1}{4}$	25	$6\frac{1}{4}$	$8\frac{4}{5}$	$14\frac{1}{2}$	4
$2\frac{1}{2}$	$22\frac{2}{3}$	7	$8\frac{1}{5}$	15	$3\frac{3}{4}$
$2\frac{3}{4}$	$20\frac{1}{2}$	$7\frac{1}{4}$	$7\frac{2}{3}$	16	$3\frac{3}{8}$
3	19	8	$7\frac{1}{6}$	17	$3\frac{2}{5}$
$3\frac{1}{4}$	$17\frac{1}{2}$	$8\frac{1}{2}$	$6\frac{3}{4}$	18	$3\frac{1}{8}$
$3\frac{1}{2}$	$16\frac{1}{4}$	9	$6\frac{1}{3}$	19	3
$3\frac{3}{4}$	$15\frac{1}{6}$	$9\frac{1}{2}$	6	20	$2\frac{5}{6}$
4	$14\frac{1}{4}$	10	$5\frac{2}{3}$	25	$2\frac{1}{4}$
$4\frac{1}{4}$	$13\frac{5}{6}$	$10\frac{1}{2}$	$5\frac{1}{2}$	30	2
$4\frac{1}{2}$	$12\frac{2}{3}$	11	$5\frac{1}{6}$	35	$1\frac{3}{5}$
$4\frac{3}{4}$	12	$11\frac{1}{2}$	5	40	$1\frac{3}{5}$
5	$11\frac{2}{5}$	12	$4\frac{3}{4}$		
$5\frac{1}{4}$	$10\frac{5}{6}$	$12\frac{1}{2}$	$4\frac{3}{6}$		
$5\frac{1}{2}$	$10\frac{1}{8}$	13	$4\frac{1}{2}$		
$5\frac{3}{4}$	10	$13\frac{1}{2}$	$4\frac{1}{4}$		

The table for cone angles and the proportions of wheels for screw cutting arranged as above are of much assistance to, and should find a place in the notebook of the progressive young lathe hand.

Hamilton, O. WM. PILTON.

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Grinding Reamers.

Editor American Machinist:

You published an article by Mr. A. B. Landis several years ago, entitled "Water vs. Dry Grinding—Grinding Reamers." That anticipates the article by Mr. D. C. D. Whitcomb on a "New Way of Backing Off Reamers." Mr. Landis speaks of using an "emery ring" for this purpose, and also justly commends the form of tooth produced by this means of grinding. The only two shops in which I know of this form of tooth being ground are those of the Pratt & Whitney Company, of Hartford, Conn., and the William Sellers Company, of Philadelphia, Pa.

Of the Sellers machine I know only what I have read in an article in "The Machinist" some time ago describing the machine as producing this form of tooth by moving the wheel in and out as each tooth passed it. The P. & W. machine I have seen in operation over ten years ago, and at several times since. I have at different times obtained sets of reamers ground upon this machine and I prefer them to any other. I think it is the strongest and most durable form of reamer tooth I know of.

This method of grinding produces the same result as the hand method of stoning the relief and does it quicker and better.

I have heard other makers of reamers object to the P. & W. reamers because they chattered, and I have used reamers of their make that did chatter—and of many other makes also. I don't believe any maker of reamers wants to put himself on record as never having made a chattering reamer. There may be a reamer that will not or cannot chatter under any conditions, but I do not know of it.

The form of tooth that I have obtained the best results with in reaming has been that produced by the old method of hand stoning and the Sellers and P. & W. method of grinding produces that tooth in its most approved form.

Some of the P. & W. reamers I have used seemed to me to have been relieved too much, but this is only a fault with the reamer and not with the process or machine, as I think the machine can be set to grind as much or as little as desired in relieving. There used to be objections to the B. & S. milling cutters before the patent expired, but now they are good enough for and are made by everybody, and I shall be surprised if it is not the same with the P. & W. reamer grinder.

MACHINIST.

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Accuracy of Machine Tools.

Editor American Machinist:

In the article on "Small Error Limits in Large Lathes" in the issue of August 26th, I noticed that Mr. Randol makes the statement that there are no planers, shapers or slotters that turn out accurate work. This struck me as being contrary to my experience, and I determined to look into the matter with the following results:

I took an indicator and fastened it in the tool post of a planer. On moving the platen backward and forward I found that the index finger did not stand still, it moved, but certainly not the long way Mr. Randol said it would.

On the first planer I tried, the platen had not been planed up for over four years, consequently it was not in very good condition, and a fine file was necessary to remove the high spots. Then I found that the index finger showed a variation of .00125. The indications were noticed particularly at eight different points along the platen. This machine is a 4'-6" x 4' x 12' planer.

I tried four planers in all, and every one made a better showing than the above, one, in fact, a 26" x 26" x 8' planer, did not show out more than .00025. Would say that a straight edge is a much better tool to test a planer with than the indicator.

A crank shaper stands close beside these planers. To prove the accuracy of this machine, I will just mention two recent jobs that were done by it. One was a set of parallels for the tool room, 72 in number, of various sizes. The limits on these parallels was plus or minus .0005, and on being inspected every one was found to be O. K. The other job was 20 steel blocks 14.5" long by 4.75" thick, the limit on these being plus or minus .001. These also were pronounced all right. No shims are used in planing this work, every piece being laid right down on the table.

This shaper has a capacity of 17" x 36" and its weight is about 4,500 pounds.

Next to this shaper is a slotter, 13"-stroke. As a good test of this machine we have several times planed knees or angle irons on it, and always get them perfectly square. We also fastened a 30-inch Brown & Sharpe square on the table in such a manner as would test the compound tables. The indicator proved them to be exactly square with each other.

T. ROBERTS.

[Mr. Randol says *perfect* work, which is different.—Ed.]

▲ ▲ ▲

A Planer-Tool Gage.

Editor American Machinist:

I notice in last week's paper a communication from a subscriber and a cut of a gage for use on planers; said gage being of the step pattern, varying by sixteenths. For the benefit of your readers, I desire to say that Mr. Lowe showed me a gage of this pattern in the E. P. Allis shops, made almost exactly in the style shown in the cut, varying by sixteenths, in the year 1879. In addition to the gage itself, he showed me a small step gage comprising four subdivisions, the smallest being 1-100 inch, the next 1-64, the next 1-32, and the fourth 3-64. This made it possible to get a subdivision of sixteenths down to sixty-fourths, and even to one-hundredth part of an inch. This gage was made of tool steel, hardened and ground, and was of extraordinary utility in planer work. I merely offer this information as an advance over the gage offered by your correspondent in last week's paper.

C. A. BURTON.

Kansas City, Mo.

▲ ▲ ▲

The Emery Wheel Its Own Exhaust Fan.

There is probably no one of our readers who has not felt the current of air which flies outward from every emery wheel in motion. It has, however, remained for Mr. Wm. Taylor, of Taylor, Taylor & Hobson, of Leeds, England, to turn this to good account by making it act as an exhaust fan to carry the dust away from the wheel. During a recent call at our office, Mr. Taylor made a sketch of his arrangement, which we reproduce herewith in Fig. 1. It will be seen that the wheel is surrounded by a band in the usual way, except that it is made scroll-shaped, like the core of a fan. It is obvious enough that with this arrangement the wheel will suck in air through the hole in its side and discharge it at the bottom outlet, and if the grinding be done through the hole, the air will carry the dust with it. The arrangement, as shown, is only adapted to wheels which are used on their side. It strikes us as probable that it would also produce a suction through an opening for edge grinding on the right side of the wheel, where the motion is upward, and perhaps the arrangement sketched in Fig. 2 might work on the left or downward moving side. Perhaps even the simple arrangement of Fig. 3 would accomplish the purpose. In this the centrifugal action is dispensed with, and the tendency of any moving body to drag air along with it is employed. With this plan the trough should come as close as possible to the sides of the wheel in order to concentrate the suction effect at the flaring end.

There is no doubt that, for wheels used for face grinding, Mr. Taylor's device is successful, and the others would seem to be well worth trying. Perhaps some of our readers will make the trial and let us know the results.

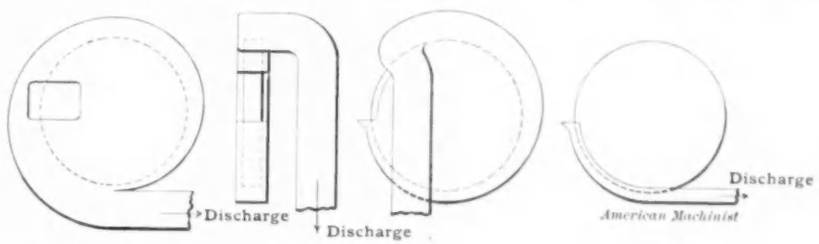

Fig. 1 Fig. 2 Fig. 3

THE EMERY WHEEL ITS OWN EXHAUST FAN.

AMERICAN MACHINIST

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The Valuation of Machine Tools.

In the course of business it is sometimes necessary, for the purpose of knowing how a business stands, or in cases of actual or proposed transfer of property, to make or to revise estimates of the values of machine-shop equipments. It is a perplexing and a more or less unsatisfactory task in many cases, and often provocative of unprofitable and inconclusive discussion. There are, however, conditions constantly occurring which it may be worth while to note, and which may suggest some guiding principles.

The personal equation is probably nowhere a more potent factor than in work of this character. It must always make a difference as to who makes the appraisal and in whose interest it is made. No honesty is altogether impervious to atmosphere, and scarcely perceptible elevating or depressing influences are always actively present, and more powerful than is commonly appreciated.

The simplest case is in dealing with the tools in actual and constant use in a prosperous and healthy shop. If the price originally paid for a tool is known, it is easy to take that as a starting point, and this is quite commonly done, the actual present value being determined by deductions from this, the values being assumed to be invariably falling. It is possible to suggest an objection to this. Every live shop at some time or other buys a new tool, and within a reasonable time thereafter the price of it is a tolerably reliable guide. Say that such a machine is bought, a lathe, a planer, a milling machine, or whatever it may be, from a good builder, and at his lowest figures, and delivered at the shop door, and that we have the invoice for it. There is labor involved in getting the machine into its place, and in setting and fastening and connecting it. Then there is a course of more or less careful examination and testing to find the limits of the machine's inaccuracies, and the weak or defective details, if they exist, and after this there is a period of slow and cautious operation, and perhaps the production of some rather inaccurate work, or even the spoiling of a piece or two, before the machine is settled down to a steady and profitable gait which can be kept up all day long. When the machine is fully broken in, it must have cost a considerable sum which should, in all fairness, be added to the actual price paid, to show the cost and value of the machine. The machine when first in fully satisfactory operation, must be worth more than it was worth on the truck at the door. The cost of breaking in a tool is usually ignored, and we have never heard of a tool being inventoried at above its original cost, except where great advances have occurred in current builders' prices.

It is a rather debatable question how long a machine may be considered new. With fair usage, and in view of the added cost of installation, there should be, in some cases, no deduction from the cost price, probably, for the first year. But the depreciation soon begins, and it continues and is to be recognized and allowed for. The depreciation from wear or use can be best judged of by those within the shop who are informed of all the vicissitudes which the tool may have encountered. It will vary widely with the usage; a machine in one case may be more worn or otherwise injured in a year than in another case in ten years. An outsider not informed of the history of a tool, and with only his eyes to guide him, can have no correct idea of its condition after a few years of service, and can only figure from his average experience.

As to the other item of depreciation in machine-tool values, in their being gradually surpassed in precision or productive capacity by machines of later design, an outsider, if generally informed as to the state of the trade, is as well equipped for correct judgment as anyone can be. It is probable that many machines depreciate in value more from getting out of fashion than from actual wear and breakage. The growing fashion for machine tools is, to have them do all they can, and when they do all that they can it will still be found that some do much more than others, and it is usually also found that the younger tool is the abler tool, and age is, in this case, always necessarily a reproach. With good lathes and planers this is not so true as with some of the other tools of the shop; but as a general rule the newer the tool the more productive it will be, by virtue of its improved design, if not on account of its actual mechanical condition. Tools there are in great number that, though not worn out, should be given away or thrown away, if no one can be found foolish enough to buy them. The depreciation of tools does not cease at worthlessness. If they are continued in service they may not only be operated without profit, but they may entail actual loss to the user.

It is scarcely proper or worth while for us to suggest actual figures of percentage to be allowed for the depreciation of machine tools in use. Probably 10 per cent. per annum would, on the average, be not unfair, with a large margin above or below for specially good or bad treatment which the tools may have received. The percentage method of depreciation is defective as applied to very old tools, as it fails to reach the minus values suggested in the previous paragraph. These values less than nothing should be recognized and appreciated by those who are responsible for the profitable operation of machine tools, and it would be a godsend to the trade if some mathematician would suggest a practicable formula.

With regard to tools not in actual operation, and where the value is to be estimated on the presumable price that may be realized at the sale of them, the case is very different. The tools then at once become second hand, and the adjective easily cuts off a half of the value. This is not always just, for the best tools, like the best men, often come to grief. Whether idle tools are presumably to be started up again where they stand, or must be moved elsewhere and reset, should make a difference in value equal to the cost of the latter operation. Of idle tools it is to be remembered that, in addition to the reproach of second-handedness which is upon them, the other agencies of depreciation are also still operative. Rust is usually considered as destructive as wear, and age accumulates as fast upon the idle as upon the most active. Tools not in use have everything against them when it comes to estimating their value.

Cycling Sixty Miles an Hour.

The general use of the bicycle by those who know nothing whatever of mechanical laws is productive of a large and perennial crop of inventions, which, whether the inventors know it or not, can succeed only by upsetting one or more laws that are so well established and so certainly right that any mechanical contrivance which attempts to get around them is a foredoomed failure. Many men who would repel with scorn the accusation of being perpetual motion cranks are yet trying to accomplish and in some cases claiming to have accomplished things which are in principle precisely the same; for it is literally true that when a man imagines that by the use of "leverage" or by some "contraption" or "gim-crack" he can put one-man power into a bicycle and get out of it four or five times as much in work against wind resistance or in climbing hills, that man is virtually a perpetual motion crank.

One mile a minute seems to be the favorite speed of those who imagine their inventions are going to "revolutionize" cycle construction, and it may be worth while to examine this a little.

A force equal to one pound moving at the rate of one mile in one minute is equal to .16 horse-power. The pressure of a wind moving at the rate of 60 miles per hour is variously given, but by no authority at less than about 10.5 pounds per square foot. Assuming that a rider and his wheel expose a surface of three square feet to wind resistance we have for the power required to overcome this resistance at the given speed $10.5 \times 3 \times .16 = 5.04$, or a little over five horse-power. A man can ordinarily exert about .1 horse-power but for a short time may exert five times as much, which would still leave him far short of the power required for pushing himself through the atmosphere at the rate of 60 miles an hour.

Improvements may be introduced that will somewhat lessen friction, but frictional resistance in the present machine, when well made and in good order, is insignificant when compared with wind resistance at high speed. Most of the contraptions heralded from time to time would increase, rather than lessen, the frictional resistance, while they do not pretend to affect either way the chief obstacle to high speed.

If one could dispense with air, i. e., ride in a vacuum, or, in air moving at the same rate as himself, there would be scarcely any reasonable limit to the speed possible to be attained with the present machine, if sufficiently high geared, but that would not be real cycling.

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A Washington firm of patent solicitors is advertising "that they have one client who recently made $2,500,000 out of one of his inventions." When an inventor, who perhaps thinks that all he needs do is to secure a patent through this agency in order to also receive $2,500,000 for it nibbles at this bait, he receives a letter as follows, and with it a lot of other advertising matter designed to entrap him:

"We are in receipt of your esteemed favor of recent date and in reply thereto we inclose herewith a copy of the patent issued to Mr. Grant Brambel, as requested. Since Mr. Brambel has taken out this patent, he has entrusted two of his inventions with us, hence we consider him as our client. We do not vouch for the authenticity of the statement that he made $2,500,000 on this patent, and our statement is based only on newspaper statements of reporters who have interviewed him in reference to same. Trusting you will always command our service, we remain, * * *

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Personal.

We will consider it as a favor if our readers will send in items of news regarding changes of foremen, superintendents or others prominently connected with the machine business. Such items are legitimate news of the trade, and we are glad to make room for them.

Mr. B. O. Bogert is now manager of the Davis & Egan Machine Company's Eastern branch.

Mr. H. F. Frevert has been appointed manager of the Garvin Machine Company, of this city.

Passed Assistant Engineer F. M. Bennett, U. S. N., has been detached from the Texas and ordered to the New York.

Passed Assistant Engineer K. McAlpine, U. S. N., has been detached from the Norfolk Navy Yard and ordered to the Texas.

Passed Assistant Engineer G. W. McElroy, U. S. N., has been ordered as inspector of machinery at the Harlan & Hollingsworth Works, Wilmington, Del.

Passed Assistant Engineer W. H. Allderdice, U. S. N., has been detached as inspector of machinery at Hillman's Works, Philadelphia, and ordered to the Newport.

Mr. J. S. Glew, M. E., formerly of Duquesne Mfg. Co., of Pittsburg, Pa., has accepted an appointment as superintendent of mechanical construction for the Geo. L. Thompson Mfg. Co., Chicago.

Mr. August Hoffman, who was formerly with Hugo Bilgram, of Philadelphia, but is now superintendent of the gear department of J. E. Reinecker, of Chemnitz, Germany, is here on a trip, combining business with pleasure. He will look after some machinery matters here, and when he returns next week will take with him his bride.

It was announced in various publications, our own among the rest, that Prof. D. S. Jacobus had been appointed to the Chair of Mechanical Engineering at Stevens Institute of Technology, made vacant by the death of De Volsen Wood. The actual arrangement is that Prof. James E. Denton succeeds Prof. Wood, Dr. William E. Geyer becomes Professor of General Physics and Applied Electricity and Professor Jacobus has been appointed Professor of Engineering Physics, including the management of the physical laboratory.

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Evening Classes in New York.

This is the season of the year when ambitious young men are planning to use their leisure evenings for self culture. The advantages offered by the West Side Branch of the Young Men's Christian Association, 318 West Fifty-seventh street, should have a strong attraction for all who wish opportunities for improvement.

The building was erected last year at a cost of over $550,000. The equipment throughout is exceptionally fine. The gymnasium has a floor surface of 52 by 109 feet with skylight overhead. There is an elevated running track, a swimming pool, bowling alleys and lockers with forced ventilation. The instruction in gymnastics given both afternoons and evenings in graded classes will begin the first of October. On Monday evening, October 4th, the whole building will be open for inspection to the public and the opening exercises of the evening educational classes will be held in the large auditorium. The subjects taught are especially intended to help young men to advancement in business; arithmetic, penmanship, bookkeeping, commercial law, stenography, typewriting, English grammar and composition, mechanical, architectural and industrial drawing, electrical engineering. Subjects for general culture are elocution, vocal music, orchestral music, first aid to the injured. On Tuesday and Friday nights lectures, concerts or social receptions will be given in the auditorium or parlors.

The fee for membership is only $5 per year with small additional charges for educational classes and gymnasium. Full information concerning the work may be had of the Secretary, Dr. D. E. Yarnell.

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If there is anything to be said in defense of the use of a sailing craft for the training of officers who are to command our steam propelled warships such defense should have as wide a circulation as possible. The "Marine" journals should certainly do all they can in this line, and the following is about the best they have yet accomplished:

"The habit of command and proper seasense can be gained only on board a sailing vessel. Is it likely that any great company owning steam ocean liners would permit any man to sail as master,

or commander, who had not qualified as seaman on a "windjammer"? A man whose nerves have not been trained and quickened in contact with old ocean under the spreading canvas exposed to the winds of Heaven, surrounded by the many vicissitudes of the deep, cannot be a seaman nor a commander of men upon the sea, to say nothing of his being able when in command of a steamer to tell by the movements of any sailing vessel, from his own experience, just what that sailing vessel is going to do and about how long it will take her to do it, incalculable advantage to any steam vessel navigator. The nation would be pitiable if the early training of our naval officers should be only in stokeholes, or even sheltered behind the weather rail of a mastless steamer."—"Marine Journal," N. Y.

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We have received a note calling attention to what the writer says is an error in one of Prof. Sweet's articles where he states that at Krupp's and Schneider's, as well as at Cockerill's, they build ships, marine engines, stationary engines, locomotives and guns. Our correspondent, who was formerly connected with Krupp's works, says that they build no ships, and as evidence of this states they are not near any navigable water, the nearest river being eight miles from Essen. Our correspondent's statement that no ships are built at Essen is probably correct, but the fact that the works is not near a navigable river would not necessarily disprove it, because steamboats are built at the Sulzer works in Winterthur, Switzerland, which works are not located on any navigable water. Boats are built there complete, but are bolted together instead of riveted. They are then taken apart, transported to the lake upon which the vessel is to run, put together permanently, and launched.

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Liquid air is one of the modern wonders, which, like the X-rays, we do not yet know very well what to do with. It is probable that valuable uses for both will develop in the course of time. The liquid air, or aerine, should at once be tried for hardening steel. When steel is red hot the quicker we can cool it the harder it will be, and surprising results should be obtained on dipping a drill, for instance, into a liquid which insists upon maintaining a temperature of —200 degrees. The result of the experiment would perhaps be more curious than valuable however.

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A correspondent wishes to know the best method of making hollow spheres of steel about one-hundredth of an inch thickness, the spheres to be four inches in diameter and to be accurately spherical.

Starting Up a Steam Heating Plant.

BY W. H. WAKEMAN.

As the time approaches when steam heat will be needed in our mills, factories, office buildings, apartment houses and schools, a few lines on the above subject will be interesting and profitable to those having this matter in charge, especially if they have not had many years experience along this line.

I assume that the plant was properly laid up last spring and is in good order at the present time, except perhaps some minor repairs that had better be done in the fall than in the spring. Now is a good time to attend to them before it is necessary to spend time with the fires. Care should be taken to know that the blow-off pipe is in good condition for it is a bad thing to have it blow out or break off under pressure, but at the same time I would caution engineers and firemen against taking a light near the man holes and hand holes of any boilers in which crude petroleum, kerosene or any similar article has been used to remove scale or prevent the internal parts from rusting, as an inflammable gas may be formed in the boiler and when a light is brought near it there may be an explosion that may prove unpleasant and unprofitable.

It is a good idea to put on the manhole and hand hole covers and then fill the boilers full of water, taking care to let all of the air escape, then put on the full water pressure available to test for leaks. If none appear the water may be allowed to run out, leaving the boilers dry until they are wanted. Do not improve this opportunity to fill the furnace with waste wood, old boxes, etc.; although it may seem to be a good plan to get them out of the way, for if a lighted match should be applied in some mysterious way, the boilers would certainly not be benefited by the operation. It is best to be on the safe side.

If a pump is needed to return the water of condensation to the boilers and if it is in good order it may be packed now with suitable packing, and it will need no further attention until the close of the season. For packing the water ends of these pumps I believe that it is best to use the same packing that is used on the steam end, for the water is so hot that it is nearly as bad to handle as the steam. The soft fibrous packings are certainly not equal to the square packings made of rubber and canvas, the whole covered with graphite, for this style fills the boxes without screwing up the glands too hard, and requires but little attention. Sometimes this comes in helical form, and if any one wants to use it in that way I know of no great objection to it, provided both ends are tapered to a fine point, so as to prevent a stubb end from crowding one side of the gland on to the rod and scoring it. However, I prefer to cut the packing into rings not quite long enough to reach around the rod, thus allowing a little for expansion, taking care to have one joint come on top of the rod, and the next one on the bottom of it, so that no two will come together. I no longer use this kind of packing for the first ring in either steam or hot water stuffing boxes, for my experience has been that it will stick to the bottom of the box and be hard to remove.

If one ring is cut from a coil of square braided flax, the proper size to fill the space between the box and rod, covered with graphite and put in first, it will work well and can easily be removed at the end of the season. As a rule the water pistons of these pumps are packed with square packing of some kind, and if there is a way provided for expanding it to compensate for wear it should be done, otherwise new packing should be put in before the plant is started up.

If a steam trap of any kind is used to return this hot water, care should be taken to know that the equalizing valve is steam tight or else the trap will not work right and water hammer in the pipes will be the result. The fact that it was tight last winter does not prove that it is now. By way of explanation I would say that this valve shuts off the live steam when the trap rises, after delivering its contents to the boilers. If the check valves are not perfectly tight the trap will fail to work as it should, and if they leak badly it will not work at all.

If there are radiators about the building that did not work well last winter now is a good time to look into the matter, ascertain the cause and apply the remedy. There are some poor air valves in the market and perhaps you have the misfortune to find some of them in your plant. If so take them out and get better ones, for where they do not work right, much trouble results, for either the water runs out on the floor or else much of the heating surface is rendered worthless.

Sometimes radiator valves are located so near ventilating shafts that they will freeze up before anything else in the room on cold nights, and these should receive attention, as usually there is some way to find a remedy if it is looked for properly.

Windows that do not close and fasten as they should, admit much cold air, and although this is not noticed or at least does no great damage, still it affects the temperature of a room very much after steam is shut off at night, and although this may not properly belong to an engineer or a fireman to do, still somebody should make it his business, and if the engineer does not do it, perhaps nobody else will interest himself in the matter.

In short then the whole plant should receive attention in all of its details at this time of the year, so that when the sudden cold snap comes everything will be in readiness for it.

Technical Book.

We have received Part 7 of "Easy Lessons in Mechanical Drawing and Machine Design," by Prof. J. G. A. Meyer. This part deals with the design of the slide valve and of the mechanism by which it is controlled. It also takes up the subject of sections in mechanical drawing, and begins also the treatment of the subject of shade lines in such drawings, and we regret to note that in this it recommends a method of locating shade lines which receives almost no indorsement by the practice of drafting rooms connected with industrial establishments. It is, we think, coming to be the general practice to place all shade lines at the right and lower edges of an object, regardless of what view of that object is shown. This practice, while it may not be in strict accordance with the science of shade lines, is simple, and answers every practicable purpose, and we think must be taken as embodying the "survival of the fittest" in the matter of shade-line practice. This, of course, does not, however, alter the fact that the part under consideration will be found of great usefulness to those who wish to study the art of mechanical drawing. Arnold Publishing House, 16 Thomas street, New York City.

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An excursion party, composed of members of the Western Society of Engineers making a flying trip from Chicago to New York and return, was royally entertained at Easton, Pa., on September 24 by the Ingersoll-Sergeant Drill Company, whose factory is at that place. The visitors, among whom were many ladies, were taken by trolley cars to the Paxinosa Inn, nearly 800 feet above the Delaware River, where the magnificent panorama, stretching as far as the eye could pierce, and sweeping uninterruptedly the entire circle of vision, was enjoyed as the sun went down. There was a little dancing to an excellent orchestra, a fine dinner with a few speeches, and the entire party, numbering then over 200, was conveyed to the works, which were brightly lit up and in full operation. A couple of hours were spent in looking through the works. The tools were seen in operation, and also several air compressors and other special machines made by the company. A large bed-plate and one or two other pieces were poured in the foundry, and an exhibition was given by the Sergeant automatic air pressure pump, which threw a stream steadier than is usually thrown by any fire engine. The visitors departed with good wishes for the continued success of the company. The entire affair was under the personal management of Vice-President W. L. Sanders, C. E.

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The "Kaiser Wilhelm der Grosse." the North German Lloyd's new steamer, arrived in this port Sunday night after a passage from Southampton of 5 days, 22 hours and 45 minutes, which is 1 hour and 46 minutes better time than the previous best time made by the American Line steamship "St. Paul." The new German vessel is now in several respects the greatest steamship on the seas. She is 648 feet long, measures 14,000 tons, and her engines can develop 30,000 H. P., 28,000 being the ordinary running development. Her engines consist of two triple expansion engines with four steam cylinders and four cranks. The screws are three-bladed, 22 feet 3 inches in diameter. They are bronze and weigh 26 tons each The crank shafts and propeller shafts are 24 inches in diameter. She has four funnels. During her recent run she made the best 24-hour run on record—564 knots, which is two knots better than the previous highest run made by the Cunarder "Lucania."

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It really looks as if the American Institute would do well to engage a smaller hall for its future fairs. Only about one-half of the available space at Madison Square Garden is occupied by the present exhibition, and that half is largely devoted to the sale of such articles as are to be found in the department stores. There are two steam engines and fifty nickel-in-the-slot machines, which gives an idea of the scope of the "fair." An excellent Ball & Wood engine in the basement drives a wood turning lathe, and that is called a "machinery hall." In the main hall, notwithstanding the exorbitant charges which deter exhibitors, and in spite of all discouragements, there are two or three really notable mechanical exhibits which we will be glad to speak of later. That such an exhibition as the present can prove remunerative to the managers is rather to be regretted than otherwise. It shows pathetically a cruelly wasted opportunity.

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We are glad to learn that John Fritz has been selected by the Naval Board to furnish an estimate of the cost of a complete armor plant for the United States Government. The appointment is in strict accord with correct business principles. Mr. Fritz, an ex-president of the American Society of Mechanical Engineers, was formerly superintendent of the Bethlehem Iron Company. With Captain W. H. Jaques he was instrumental in introducing the manufacture of armor plate in the United States. He has had many distinguished honors conferred upon him by engineering societies, both here and abroad, and of his special ability for the present task there can be no possible question.

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It is announced from Washington that Assistant Commissioner Groty has decided that Wedderburn & Co., the Washington patent attorneys, have been proven guilty of charges made against them of irregular practice, and that he recommends them for disbarment. This decision has been approved by Commissioner Butterworth, and is expected to be approved by Secretary Bliss.

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Commercial Review.

NEW YORK, Saturday Evening, Sept. 25.

THE MACHINE TOOL MARKET.

We printed enough reports from various parts of the country last week to show that the snow-ball of prosperity was apparently beginning to roll. An examination of the business status of the machine tool industry, as represented by offices within walking distance of that of the "American Machinist," corroborates this view. With harmonious accord they evidence a more healthy trade than existed a short time ago. According to some reports the month of August closed with a good showing of business, but the early or middle of September was characterized by a comparative lull. Probably this experience is not general, or if it has been, not of especial significance. The main trend of business is to be considered as decidedly an upward one, whatever may be its minor fluctuations.

WHAT TRADE CONSISTS OF.

Everybody has his own story to tell of what lines of industries are among the purchasers. Paper mills and stone yards are noticed by one. Another reports that silk mills at Paterson, N. J., are adding to their equipment and are in the market for machine tools. A third has noticed some demand for pneumatic, electrical and engine building purposes. There seems to be an increased demand for the ordinary, standard lines of tools. The specialists are not yet much pressed to buy, one seller informs us. "It is gratifying to see," remarks another, "that there is beginning to be a little more demand for the larger lines of tools—planers, boring mills, radial drills, etc. I am tired of selling only small ones. It is no more trouble and expense to sell a big tool than a little one."

WHERE INDUSTRY IS ACTIVE.

A machine tool seller returned from a trip "up the State" speaks of reviving industries in the cities and towns of Western and Northern New York—Buffalo, Rochester, Watertown, Depew, etc. A large concern in one of these places, which manufactures a class of machinery connected with railroading, was actually in need of more machinists than it could secure. But it is not impossible that there may be special circumstances to qualify this fact. The Niles Tool Works (Eastern branch) infer from their recent sales that manufacturing is picking up at Newark, N. J. Considerable business has also come from Philadelphia, and some sales have been

made, among other places, to Bridgeport and to Brooklyn, the United States Projectile Company being one of the purchasers in the latter place. Another large machine tool company, of this city, have two men in Europe, and we understand that orders are coming in quite well. Within a very short time past they have received them from at least four leading manufacturing countries of the Continent; Germany, France, Belgium and Austria.

THE BOOM IN THE MIDDLE WEST.

The New York representative of a New England tool company, who has just been traveling in the Middle West, says: "You may think that I am too enthusiastic to listen to, but I have been greatly impressed by the revival in manufacturing in the towns I have visited—Cleveland and Youngstown, O.; Sharon and New Castle, Penn., etc. In these places they are looking forward to a better winter than they have known for years. Some concerns are taking on men almost as fast as they can get hold of them. Prices of machine tools are stiffening. The Ohio Steel Company has been making some important purchases of machinery. The business revival is less apparent in Pittsburg than in other places."

NAVY YARD EQUIPMENT.

Since the machinery contracts for the Port Royal Arsenal were given out, another batch of good ones has been let by the government, this time for the Mare Island Navy Yard, at San Francisco, Cal. Of the concerns who participate, we have heard of the following: Manning, Maxwell & Moore; Niles Tool Works; Manhattan Supply Company. It is said that

(Continued on page 37.)

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Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

Fine pattern work. H. D. Phelps, Ansonia, Ct.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Cost of Manufacturing—Experienced manager will establish system of costs, giving exact account of every detail. Charge based on saving effected. Correspondence solicited. Geo. C. Thomas, 99 Nassau Street, New York. Room 212.

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Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than Saturday Morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Situations Wanted.

Pr'c. to'l. & draft. w'nts work. Box 218, Am. Mach.

Tool dresser and hardener wants position. Box 5, American Machinist.

First-class pattern maker wants pos.; exp. in all branches; references. Box 6, American Mach.

Pos. in the State of Col. by a ge'l mach. of steady habits. Add. "M.," Lock Box 68, Bainbridge, N. Y.

Position, by pattern maker, expd. mach. tools, gears, eng. work, accurate; refs. Box 8, Am. Mach.

Wanted—Position by draftsman, 6 yrs. exp., tech. edu., N. Y. or Brooklyn pref. P. D. Q., Am. Mach.

Young man wants to learn machinist's trade in small shop; good references. Box 4, Amer. Mach.

Boilermaker, as assistant foreman and layerout or flange turner, fitter up, etc. Address Box 9, American Machinist.

Wanted—Position as foundry foreman; any line of work; firms wishing better results write me. Box 7, American Machinist.

Mach., married, sober, comp., exp. lathe & bench, brass w'k., mfg. sml. intrchbl. parts, eng. building. A. S. McNutt, 232 Fountain Ave., Brooklyn, N. Y.

Wanted—A pos. as manager of a well-established mach. works by a practical mechanical engineer. Will take a monied interest. Ad Box 222, Am. Mach.

Wanted—To communicate with an Eastern university or college that wants the services of an A No. 1 mechanician a part of the time; will furnish most of tools; the rest of the time to be spent in the construction of apparatus for other institutions; 10 years exp. in this line for the best universities and colleges in country. Box 11, Am. Mach.

Have you got any ideas? I have, and I'll contract to work 'em out—both yours and mine—for the benefit of your business. Can design and build machines for special work, and they won't flash in the pan, go off at half-cock or shoot the wrong way. Besides general electrical and mechanical engineering, I have had experience in manufacturing asbestos, paper, boilers, wood and general machinery. Have served the U. S. Government as Boiler Inspector and designer. Supervising Engineer in building railroad trestles, docks, steamboats, steam road rollers, boilers and other appliances. A permanent engagement desired. James F. Hobart, 230 Eleventh Street, Brooklyn, N. Y.

Help Wanted.

Wanted—A first-class experienced tool maker, one who is up in mod. methods. Box 2, Am. Mach.

Foreman wanted for a machine shop. Those not favorable to piece work need not apply. State experience and salary expected. Address Box 10, American Machinist.

Wanted, Salesman—A reliable man to sell our Tiger brands of lubricating oils and greases as a side line or exclusively; references required. Address, The Howard Oil & Grease Co., Cleveland, O.

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Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d h'd lathes & planers. S. M. York, Clev'd, O

Calipers & Gauges. F. A. Welles, Milwaukee, Wis.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Boye, Cincinnati, O

For Sale—Machine shop and foundry, $10,000 cash, balance on easy installments; good reason. Box 220, care Machinist.

We make a specialty of Shartle's patent safety set collars. Prices low and samples free. Middle town Machine Co., Middletown, Ohio.

For Sale—Small machine shop, having good repair trade, in town of 1 400 inhabitants; no opposition. Box 232, American Machinist.

Model Locomotives—Complete castings, latest N. Y. Cen. standard, up to date; 4c. in stamps for cat. alog. G. H. Olney, 163 Herkimer St., Brooklyn, N. Y

Wanted—Some firm to make 100 4" hollow spheres of steel about $\frac{1}{100}$" thick; outer surface to be smooth and of very uniform diameter. Box 3, Am. Mach.

Lathes, planers, drills, milling machines, vises, also brass working machinery second-hand; must be modern and in first-class condition. C. C. Wormer Machinery Co., Detroit, Mich.

For Sale—6 lathes, 2 boring mills, 1 planer, 4 drill presses, 3 emery wheel stands, shafting, pulleys, hangers, chain blocks, vises, drills, etc., all in good order. Address Box 853, Cincinnati, Ohio.

For Sale—Gasoline and gas engine plant, one of the oldest manufactories of gasoline engines in this country; over 700 engines in operation; will bear investigation; good reasons for selling. Address Box 205, care of American Machinist.

A prac. mach. and draftsman, with a good line machinery to build, some money and several years business experience, would like to meet two or more machinists with about $2,500 each to join me in starting a business. Address Box 230, Amer. Mach.

A Rare Opportunity—For Sale—A mfg. plant in Brooklyn, N. Y., conveniently situated to ferries and shipping points. Equipped with 50 H. P. engine and 80 H. P. boiler, power hoist, main shaft ready to operate, steam heated. Ground 132ft. x 200ft., main buildings 132ft. x 32ft. and 124ft. x 71ft., also a number of outbuildings suitable for storage. For full particulars address Box 219, Amer. Machinist.

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Of trained experience and ability is wanted for an attractive position with one of the largest manufacturing concerns in the country. The position is an important one, requiring familiarity with close-working machines and ability to solve delicate mechanical problems. The applicant for this position must be between 35 and 45 years of age, a graduate of a first-class technical school, with long and continuous practical experience. Preference will be given to a man in employment and the best reference will be required. We desire the best man that can be obtained, and will pay from $3,000 to $5,000 per year as salary. Address, with particulars,

THE NATIONAL CASH REGISTER COMPANY,
DAYTON, OHIO.

WANTED.

The services of a first-class mechanic to take charge of a medium sized Agricultural Implement plant. A man who is thoroughly acquainted with modern methods in getting out wood and iron work and not afraid of work. All correspondence confidential. Address, giving experience, age and reference, W. 19, care Lord & Thomas, Chicago, Ill

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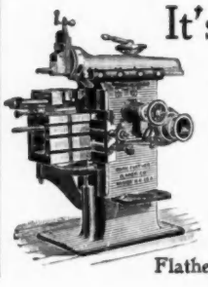

Our Shaper is a good tool, well made, special attention being given to bearing surfaces. Quickest return motion and steadiest cut of any crank shaper. Full description free.

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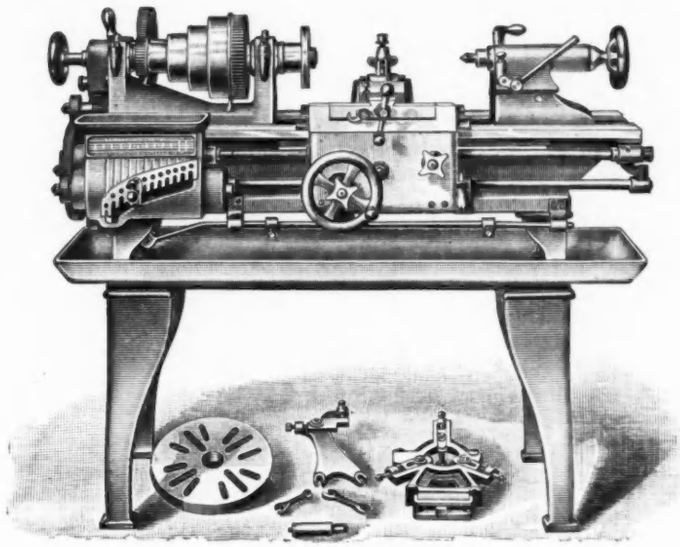
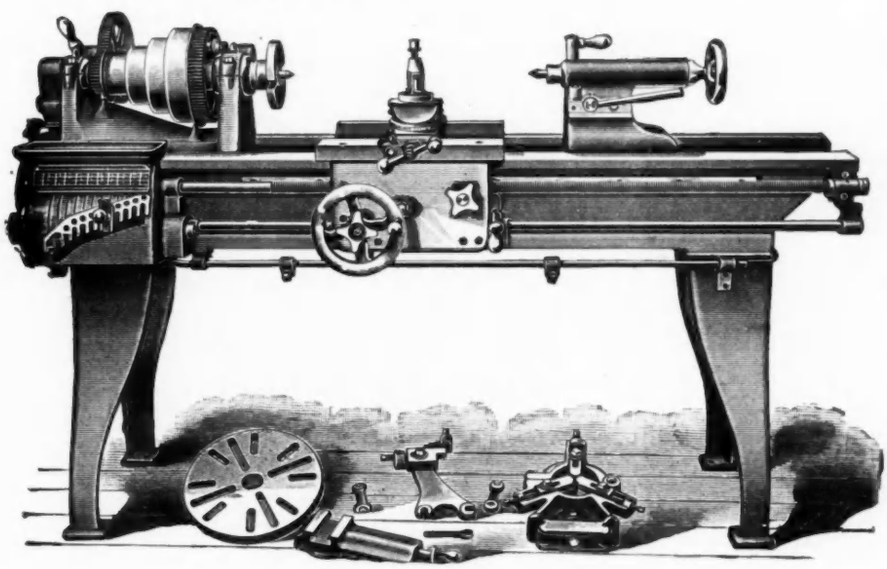


12" Hendey-Norton Lathe

is fitted with drawing-in sleeve and American Watch Tool Co's standard chuck, used in making small taps, reamers, etc. Work finished first and cut from bar afterwards. No centering required. See carriage reverse lever by right-hand side of apron; no reaching for countershaft shipper required.



14" x 6' Hendey-Norton Lathe.

These lathes are modern, high-grade, practical tools, and are specially adapted for tool-room work. They have the Norton Attachment for screw cutting, giving 36 different threads and 36 different feeds with only two changes of gear and movement of lever in gear-box from one notch to the other. Note the automatic stop under apron. It will automatically stop carriage at any desired point in either direction; invaluable for internal or duplicate work. SEND FOR CATALOGUE.

The Hendey Machine Company,

Torrington, Conn.

Agents for the Pacific Coast, Pacific Tool & Supply Co., San Francisco, Cal.

European Agents, { Schuchardt & Schütte, Berlin, Vienna, Brussels, Stockholm.
Chas. Churchill & Co., Ltd., London and Birmingham, Eng.
Adphe. Janssens Paris, France.
Eugen Soller, Basel, Switzerland.

(Continued from page 36.)

the Mare Island contracts are not yet all closed up. Speaking of government contracts, it is said that when a machine tool order was placed, some little time ago, for the Watervliet arsenal, the estimate of the successful concern was just one-half what another company bid. "And the former are selling their tools," remarks the informant of our informant, "cheaper than we can build ours." To take government contracts is, however, rather a good way to advertise.

NOTES IN PASSING.

Our attention is called by a local house to a matter, small in itself, but apparently indicative of improved business sentiment, that a Worcester (Mass.) correspondent of theirs quotes upon a noticeable large list of tools as ready for immediate shipment, indicating that it is considered justifiable by the times to carry a heavy stock.

One factor which may not affect trade much, and yet is liable to do so somewhat, is the yellow-fever plague in the South. "When you mention the subject to traveling men," remarked a machinery man to us, "they do not say much, but they turn white. The letters we receive from the South are disinfected, and we get but few of them. It does seem that Southern trade is being injured by the epidemic."

IN THE EAST AND WEST.

The Cooke Machinery Company, of this city, inform us that business shows unquestionable improvement. As to its nature, they speak of having exported saw-mills to Mexico, Central America and the Bahamas, and more recently having sold one to South African parties. They have also noticed considerable demand for pipe and fittings, both to go abroad, for which purpose two orders for large iron pipe to be used in connection with dredging have been received; and at home, namely for phosphate works in Florida. The ordinary lines of plain tools, such as lathes, planers and shapers, are in good demand. Another class of work is the supply of high-pressure blowers for foundries. They handle the Connellsville blower. Large foundries are just being started in Boston, Providence, and Allentown, Pa.; two in Brooklyn, N. Y., and one in New York city. They have received contracts from the first three of these. The last has not yet placed its order; but it will require either one unusually large blower or two a little smaller.

The Baldwin Locomotive Works, of Philadelphia, are turning out from ten to twelve locomotives a week. Their total capacity is double this, but is based upon night and day work; so this means about full day time.

One of the largest tool-building houses in Philadelphia is feeling very cheerful, saying that there is plenty of work for all,

the chief remaining complaint being the low prices.

The Davis & Egan Machine Tool Company, Cincinnati, write us: "We are pleased to report a decided improvement in domestic trade. We have received more orders from this country during the past three weeks than any two months of this year. These orders come from all parts of the United States, showing a general resumption of trade, and it is our opinion that we are just entering upon a period of continued prosperity."

Quotations.

NEW YORK, Monday, September 27.

Iron—American pig, tidewater delivery:
No. 1 foundry, Northern.....$11 75@$12 00
No. 2 foundry, Northern..... 11 00@ 11 25
No. 2 plain, Northern..... 10 50@ 10 75
Gray forge, Northern..... 10 00@ 10 25
No. 1 foundry, Southern..... 11 00@ 11 25
No. 2 foundry, Southern..... 10 75@ 11 00
No. 3 foundry, Southern..... 10 50@ 10 75
No. 1 soft, Southern..... 11 00@ 11 25
No. 2 soft, Southern..... 10 75@ 11 00
Foundry forge, or No. 4, South'n 10 25@ 10 50

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.00@1.05c.; refined, 1.10@1.15c. Store prices: Common, 1.25@1.35c.; refined, 1.30@1.45c.

Tool Steel—Ordinary sizes, standard quality, 6@7c., with some grades perhaps a little less; extra grades, 11@12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.60@1.70c.

Cold Rolled Steel Shafting—Base size, from store, in small lots, 2.15@2.25c. The price is now held by a combination.

Copper—Carload lots, Lake Superior ingot, 11¼@11⅝c.; electrolytic, 11@11½c.; casting copper, 10⅞@11c.

Pig Lead—Carload lots, 4.35@4.37½c., f.o.b., New York.

Pig Tin—For 5 and 10-ton lots, 13.65@13.70c., f. o. b.

Spelter—Carload lots, New York delivery, 4.30@4.35c.

Antimony—The range, according to brand and quantity, is about 7@8¼c.

Lard Oil—Prime city, ice pressed, ordinary quality, in wholesale lots, 40@42c.

▲ ▲ ▲

Manufactures.

The Walker Soap Company is to erect a factory on Herrs Island, Pittsburg, Pa.

The Columbia Guano Company, of South Norfolk, Va., are enlarging their plant.

At Philadelphia, Pa., the Oriental Manufacturing Company are to erect a shoe factory.

Fire totally destroyed the galvanized iron works of John Walsh & Bros. at St. Louis, Mo.

The Joseph Biechele Soap Company's Works, Canton, O., are undergoing a general remodeling at present.

The Youngstown Bridge Company's plant, Youngstown, O., has been destroyed by fire. The loss was $85,000.

The Laughlin Nail Company, of Martin's Ferry, W. Va., contemplates the erection of an addition to its plant.

The Armitage-Herschell Company, of North Tonawanda, N. Y., is to rebuild the factory which was recently burned.

The Schoen Steel Press Company will erect a plant in Allegheny City, Pa., for the manufacture of steel freight cars.

The Gibbs Acid Springs & Land Company, J. E. Gibbs, secretary, Grenada, Miss., will probably install new machinery.

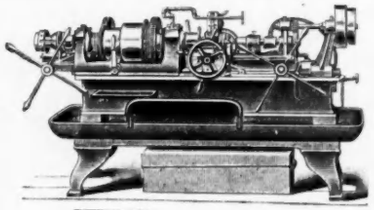
Michael Magee & Co. will begin work at once on a one-story brass foundry for the Disston Saw Works at Tacony, Pa.

H. J. Schlaacks has designed for J. N. Eisendrath a four-story and basement factory, to be built at 27 to 31 Armitage avenue, Chicago, Ill.

Work has been commenced on the founda-

(Continued on page 39.)

Bicycle : Hub : Forming : and : Drilling : Machine.



The two operations are performed simultaneously as rapidly as is practicable; but a second operation is required to finish the end of the hub held in the chuck during first operation, and this work is quickly and accurately done on another turret head machine.

For a full description of the above and other bicycle part making and assembling machinery ask for the "Machinist's Catalogue."

The Pratt & Whitney Company,
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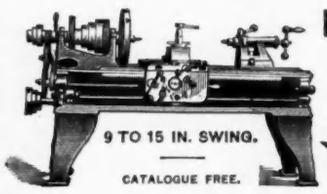
NEW YORK: 123 Liberty Street. BOSTON: 144 Pearl Street. CHICAGO: 42 South Clinton Street. LONDON, ENG.: Buck & Hickman 280 Whitechapel Road. PARIS, FRANCE: Fenwick Freres & Co., 21 Rue Martel.



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Our tools are all of the latest and most approved designs, while the workmanship, material and finish are of the highest order. You will find it an advantage to have our catalogue and special prices before placing your order.

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A Treatise upon the Principles and Practice of Shaping Metals in Dies by the Action of Presses, together with a description of the construction of such implements in their various forms, and of the materials worked in them.
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"Lightning" Screw Plates
For Machinists, Electricians, Bicycle Repairers, etc. Adjustable Dies with Guides.
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★★★
Foot Power Screw Cutting, Automatic Cross Feed, 9 and 11" Swing.
Send for Catalog B.
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IS the Perfection of Joint Packing. Instantaneous, Does Not Squeeze Out and not necessary to follow up joint. We guarantee it to last for years on any and all pressures of steam or any kind of joint where packing is required. Does not rot, burn or blow out, therefore the best for all purposes. Call for and insist on having '96 JENKINS '96, stamped like cut. . . . . .
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Die and Tool Steel.
NO BETTER MADE.

CRESCENT STEEL CO.
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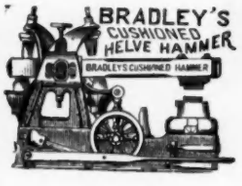

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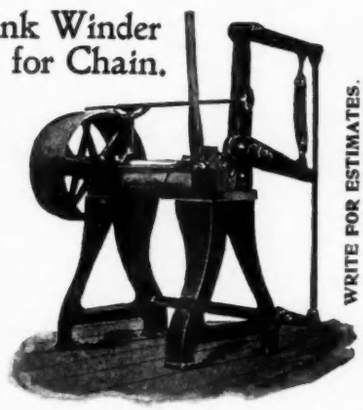
Machinists and Builders, Machinery for Wire, Chain and Nail Mills.

Link Winder for Chain.



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Catalogue of Mechanical and Electrical Books Free.

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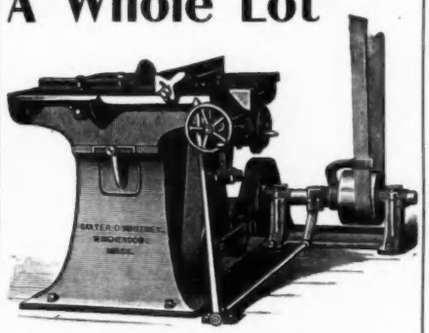
A Whole Lot



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Champion Solid Bull Neck Leather Polishing Wheels
ANY SIZE OR SHAPE.

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THE COMPRESS WHEEL CO.
16 N. CANAL STREET, CHICAGO.
Send for rates and circulars.

HYDRAULIC TOOLS
WATSON-STILLMAN CO
202 E. 43d ST. NEW YORK

(Continued from page 38.)

tion for a furniture factory—proprietors, New England Furniture Company—at Morrill's Corner, Me.

The Menke Stone & Lime Company, Quincy, Ill., broke ground recently for the new engine-house to be erected on the corner of Sixth and Cherry streets.

John Wyeth & Co., Philadelphia, Pa., are to have erected an additional story to their present plant. They are engaged in the manufacture of chemicals.

The Sternsville mill property, Pittsfield, Mass., has been bought of the Barker Bros. by Gilbert West. It is said some parts of the mills will be rebuilt.

The Altoona (Pa.) Iron Company has under construction a new boiler house, which, when completed, will be equipped with three 125 horse-power engines.

A four-story brick addition will be made to John Wyeth & Bros.' factory, at the southwest corner of Eleventh street and Washington avenue, Philadelphia, Pa.

Apollos Fuller is building an addition to his plant in Mapleton, Conn. A new engine will be put in as soon as the building is completed. More power is needed at the station.

The Pontoosuc Woolen Manufacturing Company, of Pittsfield, Mass., is to erect a new building, 150 x 58 feet. A new engine, capable of developing 200 horse-power, is to be installed also.

The Maryland Cement Company, which is building a plant at Sparrow's Point, Md., to manufacture cement from furnace slag, expects to commence operating the works in about six weeks.

The National Steel Casting Company of Montpelier, Ind., has been incorporated; capital, $200,000. The directors are C. S. East, C. F. Springer, J. A. Hindman, B. H. Whitley and John R. Sinclair.

Contractors are estimating on a brick factory to be erected for George H. McNeely & Co., Philadelphia, Pa., the morocco manufacturers. It is to be three stories high, 155 x 203 feet, and will be L shaped.

The Otto Gas Engine Company, of Philadelphia, Pa., has issued its gas engine catalog. Views of various sizes and styles of engines are shown, ranging from one to fifty horse-power. The catalog is 7 x 10¼ inches.

The old Filer & Stowell plant, at the foot of Greenfield avenue, Bay View, Wis., has been undergoing repairs for a week past, and is to be occupied shortly by the Milwaukee Steel Casting Company, with a force of 75 to 150 men.

Messrs. Loeb & Loeb, of Camden, N. J., are to have erected a new lace curtain factory. The new building is to be constructed of brick, and upon completion will be fitted up with the most modern improvements and conveniences.

The Ball Caster Company, of Cleveland, O., was incorporated by William J. Stillwell, Dr. A. V. Fried, Edwin O. Betteley, H. A. May and John W. Francisco. Their capital is $10,000, and they will manufacture ball-bearing casters.

The Worthington National Grate Company, Baltimore, Md., has been incorporated by Hermann Knollenberg, Albert W. Adt, August Beck of T., Dall Worthington and Charles J. Wiener, to manufacture and sell furnace and other grates.

The George P. Steel Company has been incorporated, to manufacture articles of metal in Philadelphia. Its capital is $20,000, and George P. Steel, C. E. Trump, G. J. Miller and W. H. McCallum, Germantown, and W. L. Joraleman, Ardmore, are directors.

Harvie & Bickley, Harrisburg, Pa., have removed their machine shops from 11 South

Tenth street to the old Brown foundry at State street and the railroad. They are making improvements at this place, and expect to increase their capacity in the near future.

The Kings County Electric Illuminating Company has secured a site in the block between the East River and John street and Bridge and Gold streets, Brooklyn. The purchase price is said to be $535,000. The electric company intends to erect a power house on the site.

We have received from the Deane Steam Pump Company, Holyoke, Mass., 1897 catalog of pumping machinery, comprising single and duplex well pumps. The catalog contains information which will be of value to those who have to do with this class of machinery, and is 5½ x 8 inches.

The American Dry Concentrating Company, Lincoln, Neb., is the name of a new corporation. The business of the concern is to buy and sell and build and manufacture and operate machines for reducing ores. The incorporators are E. Bignell, Eugene Waugh and Jessie Waugh.

The Davis & Egan Machine Tool Co., of Cincinnati, O., have just been awarded a contract by the French Government for four heavy 36-inch Standard engine lathes with 22-foot beds. These lathes are to be equipped with metric lead screw and full set of change gears for cutting a large range of threads of the metric pitch.

The Lincoln Woolen Mills, Manayunk, Pa., which have been idle for several years, have been purchased by Sylvester Taylor & Sons from the David Wallace estate for $15,000. The works will be entirely renovated, new machinery introduced and all preparations made for the manufacture of knit goods and woolens.

The building at Eighteenth and Chapline streets, Wheeling, W. Va., occupied by the big machine shops of Spear & Riddle, is being improved by its owner, John Beckett. The exterior of the structure is being repainted, while in the interior the firm has made many improvements. New machinery will be placed on the second floor.

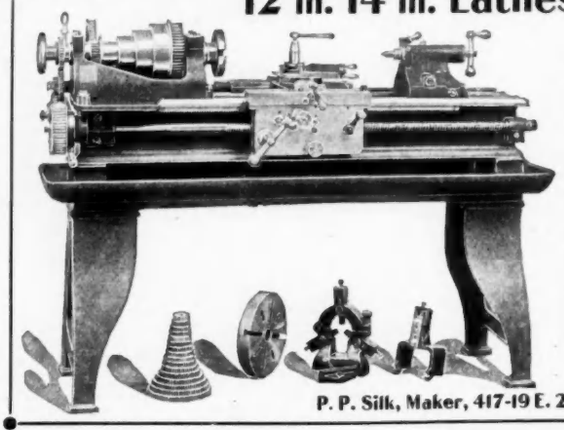
Messrs. Drysdale & Gardener, of Louisville, Ky., have leased the old Webster & Pitt foundry and Moerlein shops in that city. They will put in new and improved machinery and reopen the plant. They will make a specialty of steamboat machinery, but will manufacture machinery of all kinds and do a general foundry business.

We are in receipt of catalog No. 7 of the Northern Electrical Manufacturing Company, of Madison, Wis., in which are described and illustrated dynamos, motors and electrical equipments for direct connection to various kinds of machinery, such as printing presses, fans, fan drums, etc. A number of testimonial letters are included, and the catalog is 4¾ x 6¾ inches.

Judge Minor has chartered the Weyanoke Machine Company, Richmond, Va., a concern formed for the purpose of manufacturing and selling the George H. Hilgartner cigarette machine and other machinery. Officers: John M. Taylor, president; William H. Walker, vice-president; John M. Wortham, secretary and treasurer; W. M. Coulling, general manager; George H. Hilgartner, superintendent.

The large plant of the Keystone Plaster Company, at the foot of Jeffrey street, Chester, Pa., is to be increased, and the new addition, it is expected, will be used in the manufacture of a new product. The work on the addition has already been started, and the material is partly on the ground. The improvement will consist in the addition of a third story to the main building. This building is about 65 x 165 feet, so that it will be seen that the new floor will give the firm over 10,000 feet in additional floor space.

12 in. 14 in. Lathes a specialty



Embodying the following desirable features: Extra large hollow ground spindles. Extra large hole in spindle, 1⅝ in. Spindle bearings, 2⅞ in. x 3¼ in., 1⅝ in. x 2¼ in. Raise and fall carriage, with power cross feed and taper attachment. All feeds indexed. Cuts threads 4 to 64 inclusive. Hole in draw chuck any size up to and including one inch. Power cross feed, compound rest, taper attachment. Draw chuck pan and turret on either carriage or shears. Carriage reverse in apron. Write for prices, etc.

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The "Hugh Hill" Key Seater.

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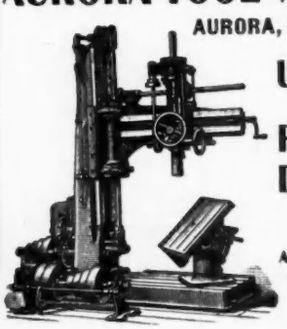

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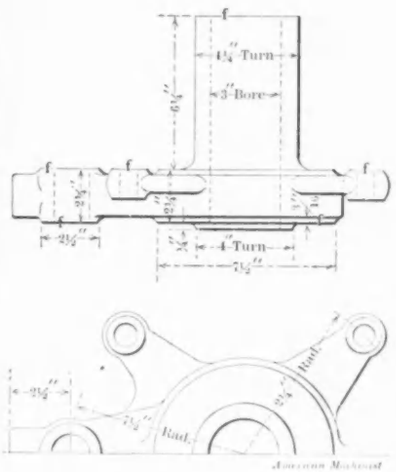

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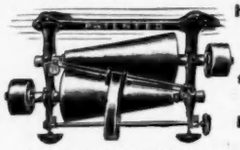
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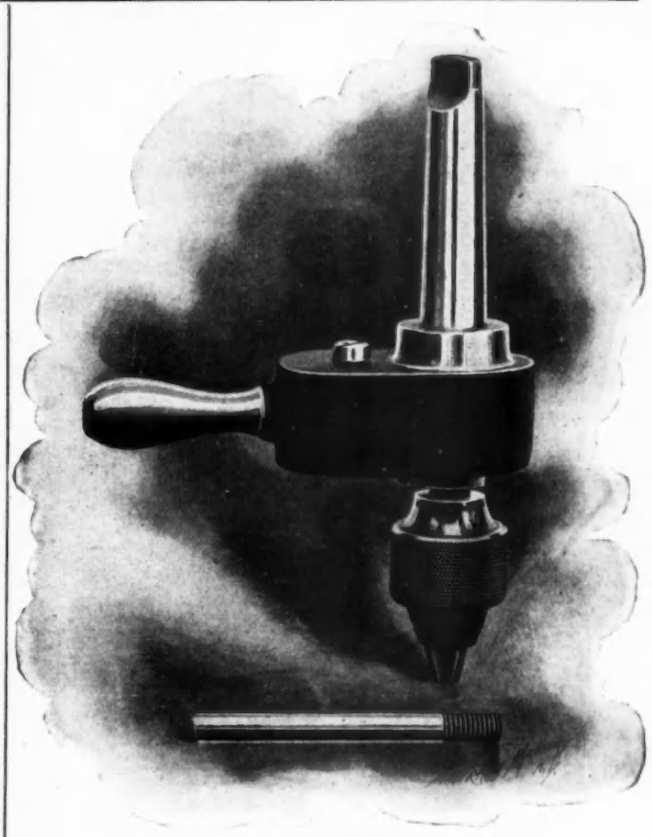

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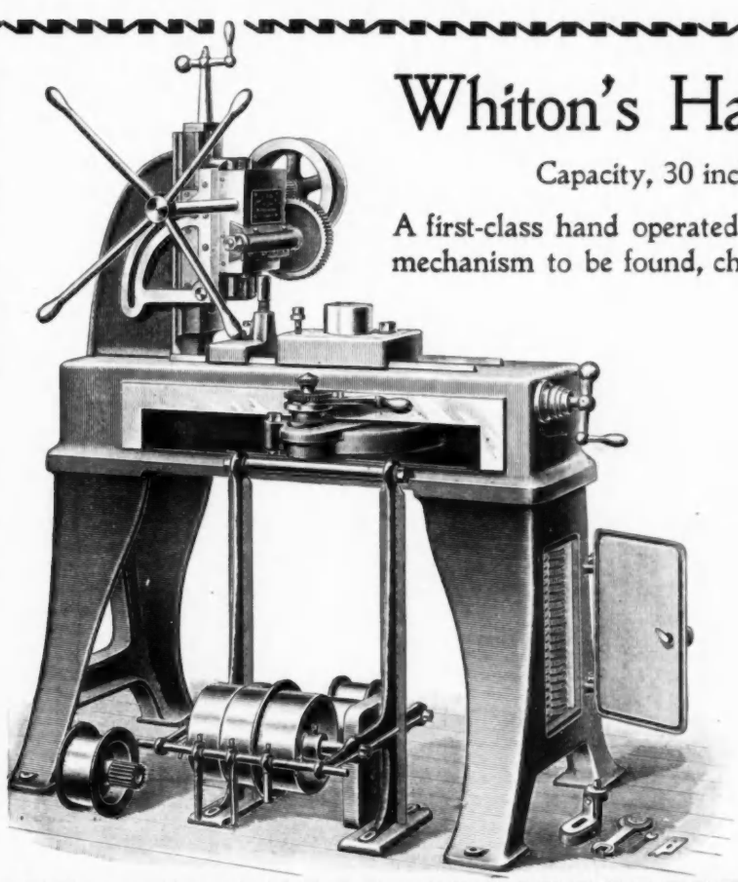

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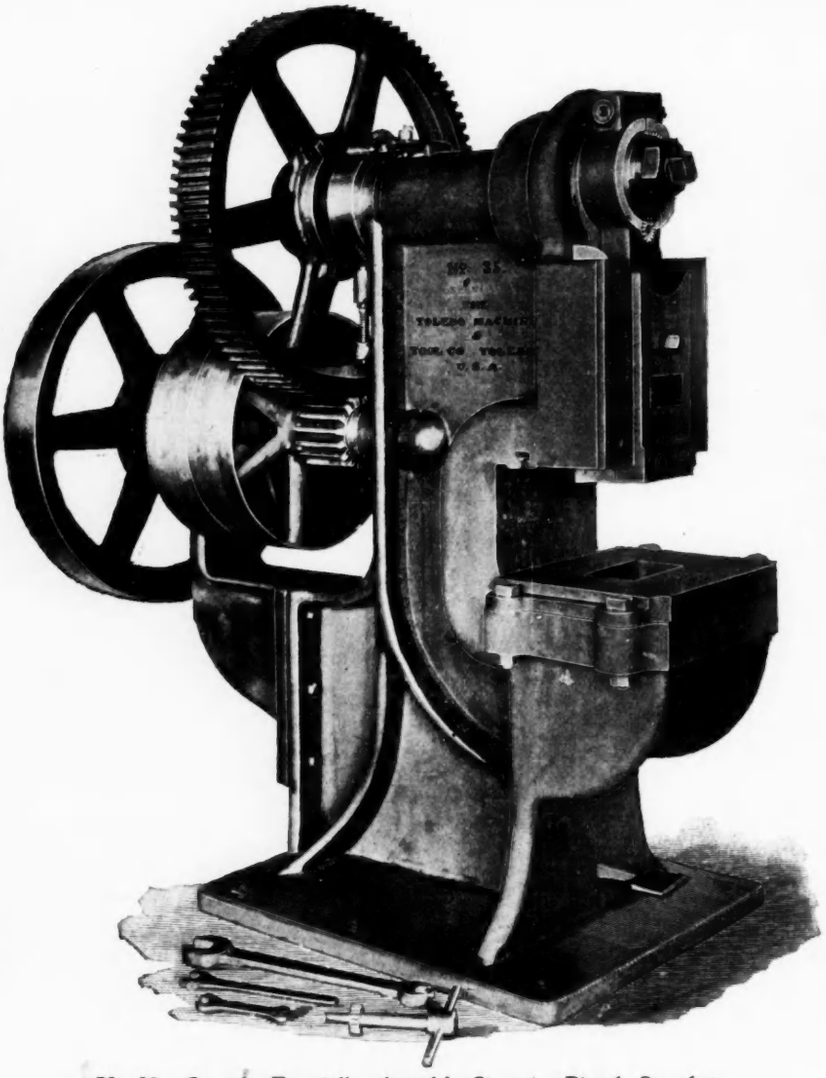

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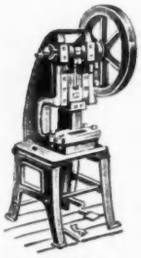

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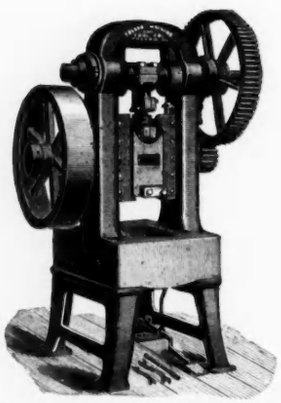

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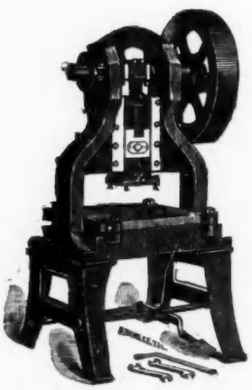

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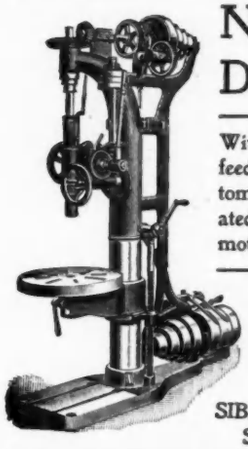

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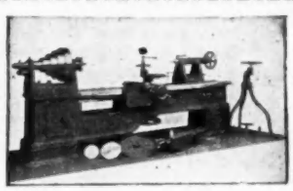

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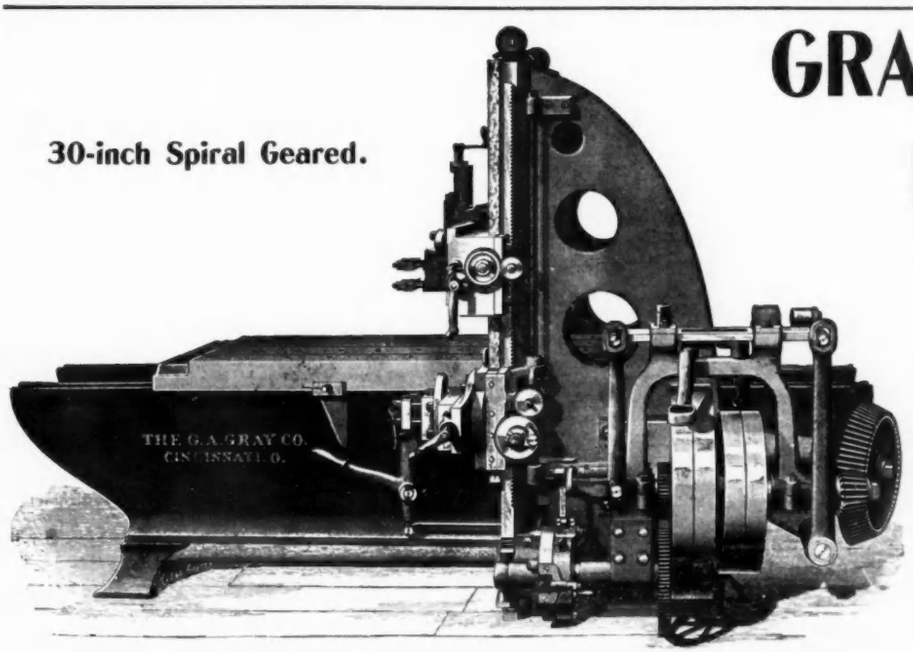

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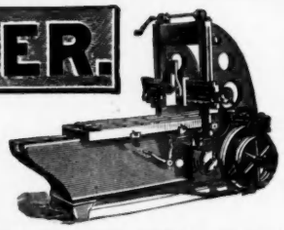

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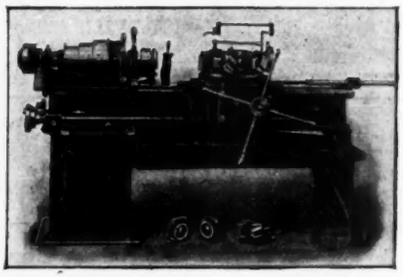

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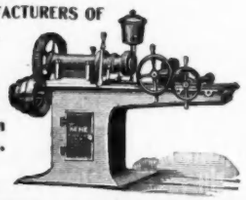

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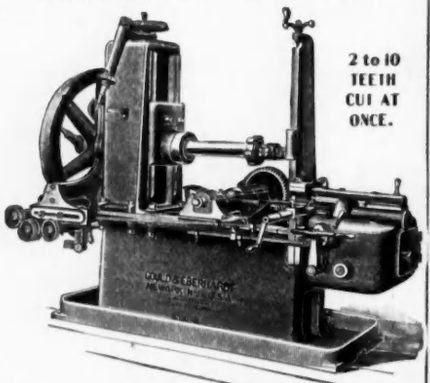

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